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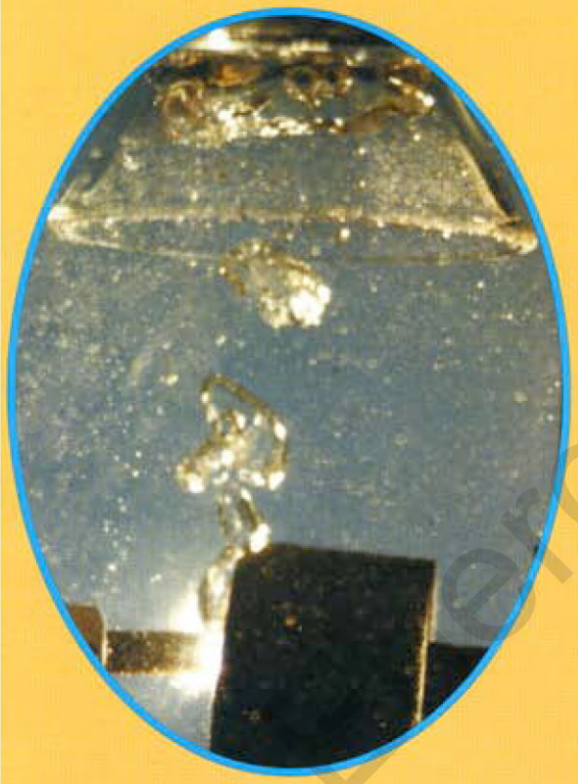

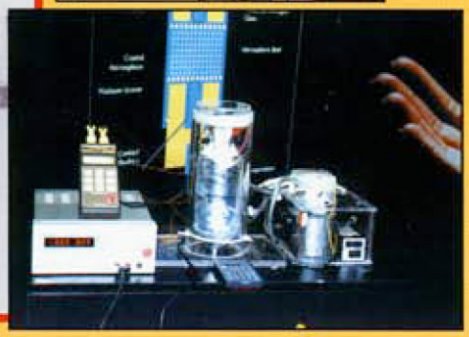

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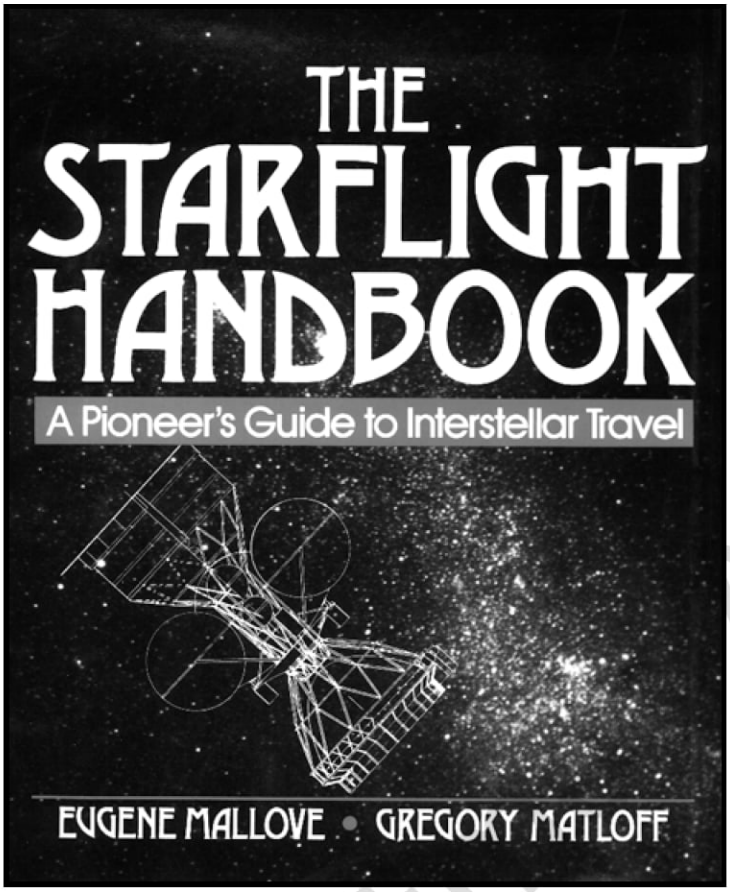

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Infinite Energy

Cold Fusion and New Energy Technology

Volume 2, No.10, Sept./October 1996

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RIFEX™ Table-Top Nuclear Research Reactor Exhibited at American Nuclear Society Meeting in Washington ***(Courtesy, Mike Carrell)***

Carbon arc struck under ordinary water produces unusual gas—clear view of bubbles rising ***(Courtesy, Rob Jaeger)***

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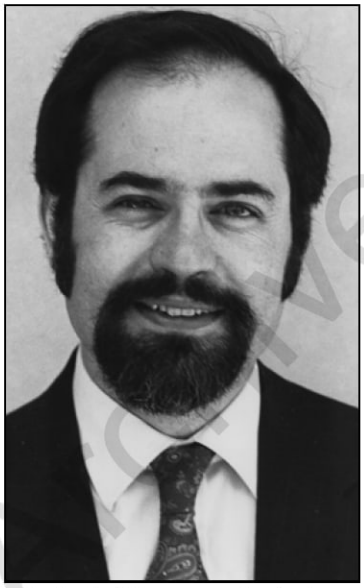
By Eugene F. Mallove, Sc.D.



Outrageous—Squared!

We have a lot to deal with as 1996 slides into 1997. Let's see: we have a small company based in Texas and Florida (CETI) selling (actually *leasing*) a table-top, very safe, nuclear reactor for do-it-yourself transmutation experiments. Got $3,750 left over from holiday shopping? It's yours for a year.

This used to be called *alchemy*. Has it really risen from the graveyard of scientific history? It has, and with a vengeance! Look at this month's **Experimenter's Corner** (p.55). It starts right out with two abstracts from a *Fusion Technology* of two years ago: two scientific groups reporting the production of iron from carbon-arc discharge under water. If it was not Fe contamination from the water or air or the ultra-pure starting carbon, where did this iron come from? Can iron be made from carbon, oxygen, and maybe a dab of hydrogen? Sure looks that way.

Well, *try it yourself*—this time in air, with no water. Folks in Japan and Boston, Massachusetts say that you can pull the iron right out of the brew with a magnet from the hardware store. If you don't have $3,750, it's the next best thing—maybe better.

Iron from air and terrestrial life's favorite element, carbon, eh? Maybe that's why we take seriously Dr. Vysotskii's paper on a confirmed biological transmutation—Mn^{55} to the relatively rare (in nature) Fe^{57} . His group did its work with bacteria. Hey, if bacteria can really do this trick—and the group checked isotopic production with Mossbauer spectroscopy—then you can bet your mitochondria that lots of living systems are doing it all the time. Surprised that we've gotten so outrageous? Wait, it gets better!

Off in Yellow Springs, Ohio, John Schnurer seems to have confirmed the "gravity-shield" effect in high-temperature superconductors. We don't have and article about this in this issue, but in *Infinite Energy* #9, we reported the development, which apparently started in Finland and now has NASA struggling to keep up. Yes, NASA is going to try it with a larger HTSC disc. Meanwhile, Schnurer has already filed a patent application for this effect, which, if real, is already in the several percent weight reduction range.

Do we know enough about gravity to say this can't be done? I think not. We'll have more to tell you about this as soon as the inventor can release details. He's hell-bent to sell demonstration kits. Buy one to go with your table-top nuclear reactor.

Had enough "miracles," maybe one or two too many, you say? Well, hold on. It looks as though Bill Richardson's AquaFuel (introduced in *IE* #9) and the similar or identical gas made differently by another group (DW Energy Research, LLC) is suspiciously over-unity in its energetics! Calorimetry done by DW, comparing the volumetric heating value of propane to "COH_2"—as DW calls it—they find that the output chemical energy substantially exceeds the input electrical energy.

Even more amazing: take into account the arc-heating of the water in the synthesis gas generation unit, and the total output energy (thermal plus chemical) radically exceeds the input energy (chemical energy in carbon plus electrical energy). How's them potatoes, or apples? In fact, you could use rotten apples or rotten potatoes—biomass—to make this gas! Run your car on apple-juice, eh? Damned right you may be!

We'll have to contain our glee just a little bit longer, but we really do cherish the thought of telling Saddam Hussein—and Texaco, Mobile, and Exxon—where to put it, once we start using water and garbage to run our cars!

Well, Paul Pantone of Price Utah (a brief mention of him in IE#7, pp.15-16) is really doing it! He has just started to sell 10 horsepower demonstration units that have an ultra-pure exhaust and get claimed increased energy output from mixtures of gasoline or diesel fuel with anything from water, to pickle juice, to battery acid, to something we all carry aboard...

We just bought one and are getting a loaned dynamometer to check it out. Since we're now confirmed "alchemists," what we really want to see is where all that carbon in the fuel is going. Why is the exhaust so clean?

This GEET development is something to watch. Paul now has his own newsletter and is gaining commercial support daily, he says.. Write to him at P.O. Box 439, Price, Utah 84501, if you are curious.

Well, maybe we won't use garbage or pickle juice to run our cars. Maybe we'll just buy a Galtech motor/generator for our new generation of electric vehicles. You know, the super-models that will have maybe just one battery that never needs recharging. Galtech, a little semiconductor materials company in Mesa, Arizona thinks it can put one of these in a dune-buggy early in 1997. We hope it goes much further than the Takahashi scooter, which disappointed us all: it didn't work any better than an ordinary scooter when Magnetic Power, Inc. tested it. Something about a bad diode connection—or maybe it was all nonsense to begin with. But why are serious people all over the place working so furiously on this magnetic motor idea if they have never seen even a tad of legitimate "over-unity." Theory says these motors *can* work without violating energy conservation—see Tom Bearden's explanation in *IE* #5&6, or read Dr. Harold Aspden's rationale in this issue (p. 50).

Oh, we can't forget fuddy-duddy old "conservative" cold fusion. It's alive, but moving all too slowly toward large heating systems. There are, however, some excellent new technologies that came out of ICCF6, despite Jed's disappointment with the scientific hierarchy there. Evan Ragland has a wonderful triode configuration cell, which should be selling

Continued on page 30

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Infinite Energy's
New Lab-Office Space

Infinite Possibilities—
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We'll, we have a roof over our heads at the Bow Technologies Center, just to the south of Concord, New Hampshire. A place to store back-issues of *IE* that everyone still wants, room (about 180 m^2) for lots of old and new laboratory equipment, and "weird machines" and claims still to be tested.

Thanks to a grant from Arthur C. Clarke, we will soon have a Hydrosonic Pump™ that will be permanently installed here for testing and demonstration to interested parties. A triode-configuration cold fusion cell from Evan Ragland should arrive early in the new year. We'll also be doing AquaFuel and Paul Pantone GEET device testing, as well as working with other carbon "arcs and sparks."

All this and the magazine too depend on the continued and growing support of those who have realized that we *are* entering a *New Energy Age*. So, dear friends, we solicit your contribution of surplus electronic equipment, computers, power supplies, plumbing supplies, machine tools, scientific instruments—anything that you think we might be able to use in our validation/verification work. Of course, we'll need rent money too. But don't worry about the heating bill... We do hope to cut that damned oil line to the burner soon enough! We'll try to send "Saddam" just a few more $'s—*EFM*

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LETTERS TO THE EDITOR

SUPPORT FROM ON HIGH...

We received the above inscribed photograph from Russian Cosmonaut Vladimir Djanibekov (handed to us by Dr. Lev Sapogin at ICCF-6 in Japan). Vladimir, shown just after a landing in September 1985, is seated on the right. Georgy Grechko is on the left. A handwritten note on the back of the color photo reads:

My dear Eugene!
You have done a great step with organizing such a possibility to learn and act in practice in the field of clean energy.
I support your position and have no doubts about very fast results in solving our energy problems for all the community of our planet.
Thank you! Good luck, my friend!

Vladimir Djanibekov

To that, Vladimir, we salute you and all your Cosmonaut colleagues with a very hearty, Thank You! —EFM

•—•—•

We are high school students at the Arkansas School for Mathematics and Sciences. We are currently working on a science fair paper involving cold fusion. There are many skeptics here at the school and we need strong facts to support our project. If you could provide us with lab reports involving cold fusion experiments, or tell us where they could be found, it would be greatly appreciated. Thank you.

Vann Vaupel
Jeff Terry

Infinite Energy *provided complimentary issues of the magazine to the students and asked them for a copy of their report, photographs of the students, etc.* IE *has has already published the cold fusion experimental work of high school student Michael Belcher of West Virginia (Issue #3, p.48)*

•—•—•

The latest *Infinite Energy* is SO GOOD, SO COMPREHENSIVE, SO EXCITING, SO ... well ... I can't find words to say what I feel. Let these suffice: THANK YOU. THANK YOU. THANK YOU.

Daniel E.Reynolds
Dayton, Ohio

Our infinite thanks to you! It is good to hear from someone hailing from where the Wright Brothers once flew.—EFM

•—•—•

I have been following the developments in this field with great interest, through a subscriptions to *Infinite Energy* and other publications, the Vortex archives, and other Web sites. I think what is happening in this field is of truly historic proportions, and I would be very excited to be of service in bringing this technology to market. I am writing to offer the services of my company, as experts in the emerging field of electronic commerce, to provide the means to sell interests in an investment fund over the internet. Of course, this offer presupposes that the concept of "SuperPower, Inc" as discussed in your recent editorial (*IE#9*), becomes a reality. We do not seek cash compensation for these services. Instead we propose that we be compensated solely with equity in the fund, equivalent to the value of the services we would provide. In other words, we would like to make an investment of sweat equity.

If you think that my services could be of value [see our WEB site at http://www.melnick.com], or would like more information, feel free to call me. In any event, thank you for taking the time to consider this offer and thank you also for your many well written articles in *Infinite Energy*, and for all those battles to open minds.

Mike Melnick
President, Melnick Consulting Group

We will certainly consider taking you up on your offer, if and when "SuperPower, Inc." gets off the ground. —EFM

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• — • — •

Regarding your "SuperPower, Inc." concept for a capital pool for venture investing in new energy R&D, I'm all for it —and the idea of us (investors) having an equity interest in the results is appealing. Please add my name to any such list of those interested that you may be constructing.

Willard D. Nelson
Olympia, Washington

We are making our list and checking it twice!—EFM

• — • — •

Thank you for your fascinating and revolutionary effort!!

Steve Jackson
Simcoe, Ontario, Canada

• — • — •

Dear Jed [Rothwell],

I want to thank you for your kind words about me in Ifinite Energy, Vol. 2, #9, p. 16. There has been a direct, positive consequence: Jerry Drexler read this report, and his foundation [The Drexler Foundation-Ed.] contributed $5,000 to our research (see enclosed letter). This will be very helpful to our efforts.

For your information, I have also enclosed the M.S. thesis of Radovan Kopecek, which I discussed at College Station [Second International Conference on Low Energy Nuclear Reactions—Ed.].

The grant we received is a manifestation of the importance of your work of communicating cold fusion developments to the public. Thank you again.

Professor John Dash
Portland State University

• — • — •

We have greatly enjoyed your coverage in Infinite Energy of the recent research of Mizuno[1] and of Miley[2] on "anomalous" transmutation associated with electrolytic action at the cathode of an electrolytic cell. Mizuno's paper[1] was, in fact, first published in the March-April 1996 issue of *Infinite Energy*. Their work, done independently of each other, appears to merit the many plaudits being given. Because of the considerable attention focused upon their papers and the considerable interest in this topic, it may be of interest to your readers to learn that their work is not the first published research in cold fusion for which strong evidence has been given for the production of numerous elements at the cathode of an electrolytic cell. Such work has been done by us at Cal Poly, Pomona, and was first presented by Dr. Bush at the Maui Conference (ICCF-4) in December of 1993. The paper[3], "Evidence for Electrolytically Induced Transmutation and Radioactivity Correlated with Excess Heat in Electrolytic Cells with Light Water Rubidum Salt Electrolytes," was among the Conference papers chosen for publication in *Transactions of Fusion Technology* in 1994. It reported a study by Bush of the production of Sr from Rb employing electrolytic cells designed by the two of us and constructed and calibrated by Eagleton. The electrolytic cells featured Ni fibrex cathodes, Pt anodes, and light water based rubidium carbonate electrolyte.

The paper[3] first makes a strong case for Sr production from Rb. (In addition to a SIMS* study, an ICPMS** study was made on Sr that had been significantly enhanced in concentration relative to Rb by employing an ion-column separation of the Sr and Rb. The ICPMS study gave support to the SIMS work, ruling out the likelihood that the SIMS result might have merely been due to the presence of rubidium hydride. The ICPMS result thus supported the SIMS result that the (Sr-86)-to-(Sr-88) ratio for the post-run cathodic material was nearly equal to the (Rb-85)-to-(Rb-87) ratio as opposed to being equal to the natural abundance ratio of the two strontium isotopes. This result had been predicted by Bush[4] in an earlier paper.)

Secondly, the paper[3] presents SIMS evidence for the "lattice-assisted nucleosynthesis" hypothesized by Bush of measurable amounts of the isotopes of the following elements: **Y, Zr, Nb, Mo, Ru, Tc, Rh, Pd, Ag, Cd, In, and Sn.** Because of the signal findings supporting the production of Sr from Rb, we feel that this part of the paper[3] has been overlooked by other researchers. (Bush's study of these results has also been presented by him at the first International Conference on Low Energy Nuclear Reactions[6] at Texas A&M.)

Two features of this work may be of special interest to your readers:

(1) Based upon the SIMS mass spectrograms of both the pre-run and post-run cathode material, and detailed knowledge from the Rb/Sr study for normalization, Bush was able to employ his LANT Model ("Lattice Assisted Nuclear Transmutation") to estimate that the total energy released in the nuclear production was $(3.8 \pm 0.4) \times 10^{19}$ MeV, which compares quite favorably with the total excess heat determined from calorimetry of $(4.0 \pm 0.8) \times 10^{19}$ MeV. Fig 1 is from the paper detailing this. (Fig. 2 shows Bush's theoretical cold nucleosynthetic chain beginning with Rb, and based upon his LANT model.)

As far as we can tell, this appears to be the first published study showing a correlation between the observed excess heat and the transmutation products. (Bush wishes to point out in connection with the agreement between these two results that since in retrospect there are apparent cold fission products as well as the above cold fusion products exhibited by the SIMS mass spectrogram, the excess energy in cold fission reactions that ends up in the metal lattice must be essentially negligible, unlike the case for cold fusion reactions. Excess energy is apparently carried away by particles as hypothesized by Bush[5], suggests neutrinos as likely accomplices in this energy-disappearing act.)

(2) The radioactive decay associated with the post-run cathode for another similar cell was monitored by employing a sodium iodide scintillation detector fed into a multichannel analyzer. Bush[3] makes a case in the paper that the oberved half-life of approximately 3.8 days is associated with the decay of a mixture of Tc-96 (half-life: 4.35 days), Ru-97 (2.90 days), Pd-100 (4.0 days), and In-11 (2.8 days). As far as we know, this data represents the first reported results for the radioactive decay of cathode material for an electrolytic cell employed in cold fusion research.

Because of these features, it seems that the Cal Poly work may now be seen as a significant precursor of the work done by Miley[2] and by Mizuno[1].

Thank you for allowing us to share this information with your fine readership. We have greatly appreciated the excellent job that you are doing as Editor in guiding the destiny of *Infinite Energy*.

Dr. Robert T. Bush
Dr. Robert D. Eagleton
Physics Department
California State Polytechnic University, Pomona

1. Tadahiko Mizuno, Tadayoshi Ohmori, and Michio Enyo, "Anomalous Isotopic Distribution in Palladium Cathode after Electrolysis," *Infinite Energy*, No. 7, p.10 (1996).

2. George Miley and James Patterson, "Nuclear Transmutations in Thin-Film Nickel Coatings Undergoing Electrolysis," *Journal of New Energy*, 1, No.3, p.5 (1996).

3. Robert Bush and Robert Eagleton, "Evidence for Electrolytically Induced Transmutation and Radioactivity Correlated with Excess Heat in Electrolytic cells with Light Water Rubidium Salt Electrolytes," *Transactions of Fusion Technology*, 26, No. 4T, 344 (1994).

4. Robert Bush, "A Light Water Excess Heat Reaction Suggests that 'Cold Fusion' May Be 'Alkali-Hydrogen Fusion'," *Fusion Technology*, No. 22, p.301(1992).

5. Robert Bush, "Some Theoretical Observations Upon Lattice Assisted Nuclear Reactions in an Electrolytic Cell with Pd (Cathode) and Pt (Anode)," Presented for Bush by Jim Dunn at the Second International Low Energy Nuclear Reactions Conference, College Station, Texas, Sept. 13-14, 1996. Accepted for publication by the J*ournal of New Energy*.

6. Robert Bush, "Can the ECFM ('Electron Catalyzed Fusion Model') Account for Light Water Fusion?," Talk presented at the: First International Low Energy Nuclear reactions Conference, Texas A&M. June 1994.

New Energy Times Archive

*The SIMS mass spectrograms were made in 1991 under the auspices of a National Laboratory, whose name cannot be used yet because of the "politics" of cold fusion.
**The ICPMS work was carried out in 1992 by West Coast Analytical Service, Inc. of Santa Fe Springs, California.

We thank Dr. Bush and Dr. Eagleton for reminding us of their outstanding pioneering work, which certainly qualifies among the first—if not the first transmutation evidence in electrochemical cells.—EFM

• — • — •

As a footnote to my two articles about the Correas' discovery (*IE#8 and #9*), let me say that I am pleased with the vigorous discussion they evoked and gratified by the kind words from some readers. Different views and expectations were expressed, which are summarized below, with my comments. It should be understood by all that the source information was only the three Correa patents and three supplementary oscillograms, plus explanations and discussions by Dr. Correa.

1. Do the patents support a discovery of an unusual energetic phenomenon in a gas discharge tube? (Yes)
2. Do the patents contain evidence of systematic scientific work, literature searches, comparisons of findings with previous work, extensive testing, and probable utility? (Yes)
3. Are the patents scientific journal papers? (No)
4. Do the patents contain evidence of o/u performance of the system? (Yes)
5. Is the evidence of o/u performance in the patents irrefutable? (No)
6. Are the articles journal papers? (No)
7. Is the evidence presented in the articles totally self-consistent? (No)
8. Are the fragments of evidence presented in the articles consistant with o/u? (Yes)
9. Do the fragments of evidence in the articles fairly present the Correa's patent data? (Yes)
9. Are the data and illustrations of the article lucid beyond reproach? (No, but try the patents for comparison.)
10. Am I in possession of other documentary evidence of long-term o/u performance? (No)

The purpose of the article was to present to the readers of *IE* an introduction to the Correas' work and the nature of their findings as contained in the patents. The patents relate to their work as of 1992. The article is indicative but not conclusive. Readers are invited to draw their own concolusions. If any are motivated to further study of the PAGD phenomenon, my purpose will be fulfilled.

Mike Carrell
Cinnaminson, New Jersey

• — • — •

The following occurred to me while reading Michael Carrell's article on the Correa invention. Perhaps it would interest some of your readers.

Could the extra energy observed by the Correas[1] be the result of nuclear transmutation? Sir J.J. Thomson and others obtained helium and neon in electrical discharge experiments[2]. Transmutation of nitrogen atoms on an electrode surface was suggested to be the source of these gasses[2] .

Recent experiments have yielded results which can most reasonably be attributed to transmutation of atoms at metal surfaces in the presence of water[3] or deuterated water[4].

The Correas experiments were performed in the abnormal glow discharge region, the region generally employed in metal sputtering. The following quotes are from a paper by Tuve, Breit and Hafstad[5]:

"The chief difficulty with very high-voltage tubes is that of preventing the uncontrollable (cold-cathode) emission which limits the voltage which can be applied."

Energy released during the uncontrolled emission caused their Pyrex tubes to puncture. They were able to greatly increase the voltage at which a tube could be safely used as follows:

"An important point about bringing up a tube to a high voltage is 'breaking in' as in the case of x-ray tubes on direct current or low-frequency alternating current. When a potential is first applied, the tube may flash at one half of the potential which it stands without puncture after it is broken in. Our procedure is to bring the potential up cautiously until the tube flashes. Then the potential is lowered until the flashing disappears. The potential is brought up until the tube flashes again and the procedure is repeated."

In my experience, flashing includes a bright white spark on the cathode surface. Likely, the "breaking in" affects the cathode surface.

"The 'breaking in' lasts, that is, if a tube is broken in one day it can be broken in to the same voltage on the next day in a much shorter time. At times no 'breaking in' the next day is required."

Could the energy released during the flashing be from the transmutation of nitrogen or other atoms on the cathode surface as suggested by Baly[2]? If so, it may also be the source of the excess energy reported by the Correas (who appear to have controlled the "uncontrollable emission").

Possibly the Correas' spent tubes could be rejuvenated by exposure to nitrogen under the proper conditions.

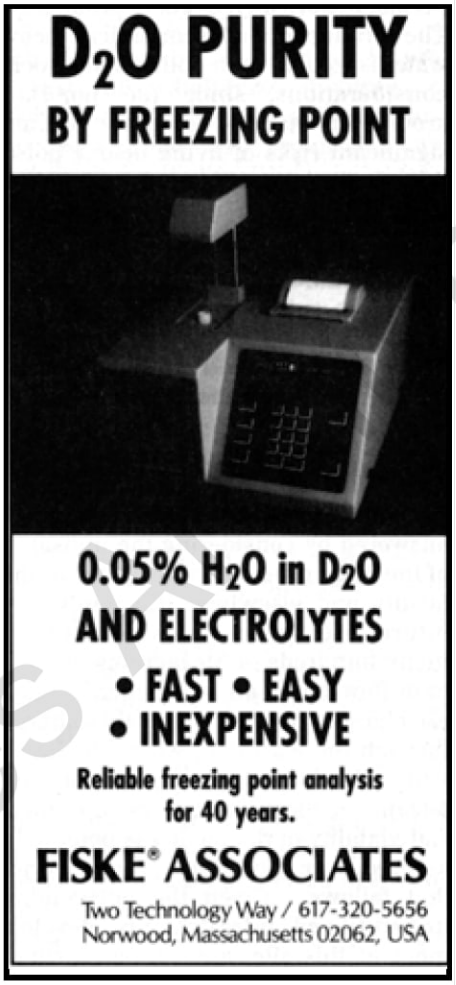
Paul E. Rowe
Mashpee, Massachusetts

1. Carrell, M., *Infinite Energy*, Vol. 2, No.8, 1996, pp.l0-14.
2. Rowe, P.E., *Infinite Energy*, Vol.2, No.8, 1996, pp.30-31.
3. Bockris, J.O'M. and Minevski, Z., *Infinite Energy*, Vol.2, No.5&6 pp.67-69.
4. Mizuno, T., Ohmori, T. and Enyo, M., *Infinite Energy*, Vol.2, No.7, 1996, pp.10-13.
5. Tuve, M.A., Breit, &. and Hafstad, L.R., *Phys. Rev.* 35, 1930, pp.66-71.

We thank Paul for his always perceptive observations.—EFM.

• — • — •

I wanted to pass along some cheerful thoughts. People with heavy concrete thinking will sink to the level of their abili-



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ties, no matter how many degrees and how high their positions. And they will stay there.

Frozen brain possessors will never let anything change their mental concepts that were set in frozen brain tissue after they were implanted there. Frozen brain syndrome is characterized by childish behavior when these concepts are challenged, shaken, or proved totally wrong, such as screaming at the bearer of new ideas and, in olden times, the prompt execution of such individuals, burning at the stake, excommunication from whatever religious beliefs that the bearer possessed or other nasty and painful happenings.

Frozen brain persons will usually expire of overinflated egos or overdose of laxatives, which will cause the brain to disappear down the potty, since it is indistinguishable from the other stuff and therefore unsalvageable. No loss there.

Incidentally, both subspecies of human mentioned here usually die an early death due to cranial detonation when the truth comes to the light of day, and their wrong thinking is apparent to their leaders. So cheer up, WE will outlive the (expletive deleted)s, and get our day in the sun sooner or later. Remember the same reverses that are happening with CF and magenetoresonant motors took place in radios' early days, but it ultimately triumphed.

Richard Morrow
Corpus Christi, Texas

We appreciate that earthy assessment by our ham radio friend near the Gulf of Mexico. Indeed, "Don't Mess with Texas!" —EFM

•—•—•

I would like to read an article in the next issue (*IE#10*) which details an exact experiment involving the generation, collection, and combustion of this "AquaFuel" gas.

From seeing the picture on the cover of *IE* No. 9, it is easy to think that you simply put your electrodes in tap water, place a funnel over the electrodes, turn it on, and collect the gas. And I am also sure that the experimenters out there with arc-welders will try to reproduce this experiment, as soon as they finish reading the article.

Information is still lacking, I feel, to show us how to reproduce this. What brand of arc-welder is being used; what type of electrodes; what is the seperation distance; is simple tap water or distilled or filtered water preferable, etc.?

I would like to see the experimental write-up for how the author produced the picture on the cover. From the picture, we know that the setup which was used worked, and I would like to duplicate this.

If an internal combustion engine can operate with almost no modification (as the article suggests), I would like to begin production of my own AquaFuel and perhaps operate my car with it. Or if fuel-injected engines will not work, perhaps find a used (very inexpensive) carburetor-equipped car and drive it with this new gaseous fuel.

New Energy afficionados will be watching this very closely. An extremely simple-to-replicate experiment has yielded surprising results. Perhaps soon, Toyota or some other car manufacturer will begin making cars with real "gas" tanks!

Robert Tilley
Cape Canaveral, Florida

AquaFuel is, indeed, easy to make, just as the picture shows. It may be easiest to work with a few lead-acid automobile storage batteries in series, with 0.25-inch diameter or greater carbon rods (obtained from a local welding supply shop) held by alligator clamps to well-insulated leads. An standard arc-welder —DC or AC— will also do. The power will determine how much gas you produce in a given time. Then all that is needed is a tank of tap water, an inverted funnel, and a tube to collect the gas. But PLEASE, you must observe safety precautions! There are electrical hazards, explosion hazards, and toxicity of the CO in the gas. See the continuing coverage of this type of gas in this issue of IE. *The great beauty of this is that home-experiments are very easy to do, but SAFETY FIRST!—EFM*

•—•—•

The recent low-energy transmutation reports inspired this posting on the Vortex forum:

Now that it appears that nuclear transmutation may be possible under mild conditions it may be worthwhile to look at the hypothesis that it is going on in biological systems. While the chicken and egg stuff is nice because we can study them, I think the case of the ancient, long extinct, metal loving bacteria is more interesting. George Miley has allegedly transmuted large quantities of metals (*IE#9*) and the question I have is: could these bacteria have been doing the same thing? It is generally accepted that iron ore deposits were caused by iron-loving bacteria dying and forming a sedimentary layer. There is good evidence that other metal deposits like gold are caused by the appropriate metal-loving bacteria. These bacteria are gone now (what a shame) so we don't see something like a pond with a layer of gold sediment on the bottom. We would have noticed something like that.

The question I always had is why did these bacteria want so much of their favorite metal and how could they get so much of it? And then why are they all gone now? Modern bacteria can lay down sediments but there is not any significant metal concentrations in them. One theory could be that the bacteria actually lived on CF energy and the associated metal deposit was actually a nuclear metabolic waste product or the nuclear ash. The bacteria would then die when they had consumed their feed elements. This would reduce the concentration of the feed elements and increase the concentration of the waste elements.

If we knew the starting concentration in the earth and the effect of differential settling of the heavy elements then we could compare to the present concentration to find out which elements make good nuclear food. The good food elements should be reduced in concentration and should be the best candidates for CF reactions. Making an unscientific estimate of this, I took the concentration of the elements in stony and iron meteorites, from the Scheffield University element web page, and added them (not knowing what weight to use). Then I divided by the observed concentration in the Earth's crust. So then large numbers, larger than expected from the differential settling effect, should indicate good CF reactants. The result in no particular order (except for some of the larger values first) is:

Element	**Ratio (meteor/earth)**
rhodium	21,650
ruthenium	11,900
iridium	1,210,000
osmium	83,700
rhenium	2,250
platinum	20,100
palladium	7,733
silver	1.7
gold	1,654
tungsten	8.2
mercury	2.6
cadmium	.73
molybdenum	5.9
indium	.285
thallium	.005
lead	4.3
niobium	.015
tantalum	.043
tin	.94
nickel	1,025
halfnium	.045
aluminum	.122
titanium	.13
cobalt	350
iron	28
bismuth	10.6
antomony	2.2
copper	8
zinc	1.1
vanadium	.43
chromium	36.5
calcium	.30
zirconium	.094
uranium	.006

The first seven elements on this list would be good candidates. A noticeable standout is nickel with a relatively light weight and a ratio of 1,025. Where did all the nickel go? It seems too light to have all

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but one part in 1,000 gone to the center of the earth. Maybe something ate it or maybe it was transmuted through geological CF. And that iridium ratio, 1.2 million, is an amazing number. I would believe that number if there only was molecular diffusion in the Earth's core but the eddy diffusion would totally overwhelm the molecular diffusion. The number should be closer to 10 than a million. I think that somehow the vast majority of the Earth's iridium was transmuted. Iridium is likely the most reactive CF element, but of course it is very expensive. Rhodium is up there too and last I checked it was $5,000 a Troy oz. For a cheap reactant metal, nothing beats nickel, but I guess we already knew that.

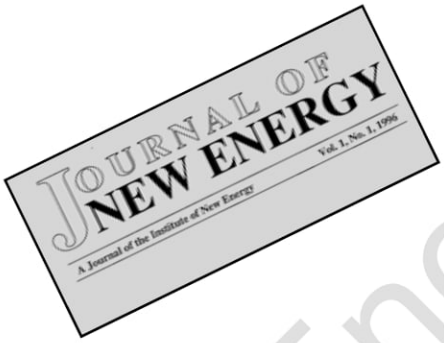
Lawrence E. Wharton
Greenbelt, Maryland

These are wonderful, appropriate speculations. See the article on a Russian biological transmutation experiment, plus references to other such work, in this issue of IE.—*EFM*

• — • — •

Several weeks ago, I received issue #9 of *Infinite Energy*, which I greatly enjoyed. Thank you for publishing the report by Dr. Forward (It alone was worth the entire subscription price! Just compare it to the report price from NTIS.

Bill R. Eubanks



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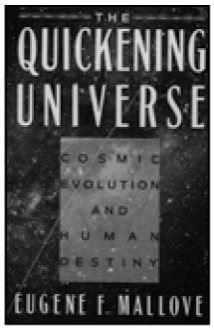

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Athens, Alabama

We were happy to be able to publish Dr. Forward's "Mass Modification Experiment Definition Study," even though it helped run the magazine to 72-pages, instead of the usual 60. And we have few advertisers—yet— to support us in this new field. So we appreciate your kind words.—EFM

• — • — •

Thank you for your prompt response to my request for a subscription and back issues to *Infinite Energy* magazine: quicker than most UK publishers.

Ever since 1989, I have thought that research in the field of cold fusion (or whatever) is potentially more important than just about all other areas of research put together. Even if there were only a 10% possibility of there being anything behind it, one would have thought that much more research should have been undertaken because of the unimaginable benefits if it proved viable. It's nice to see from reading your magazine that I'm not the only one.

On reading various articles about the general reluctance to start some form of commercial exploitation, I was immediately put in mind of a short story which I first read some 30 years ago. It is so appropriate to this situation that it could have been specially written to illustrate it. The story is "The Toy Shop" by Harry Harrison, and fortunately I was able to locate it amongst my mounds of yellowing paperbacks: a copy is enclosed. If your budget could stretch to paying the copyright fee it might be useful to reproduce it in *Infinite Energy*, as it may stimulate some sort of imaginative action from one of the research groups or commercial organisations.

David Woodhead
Thatcham, Berkshire, England

Thank you for the copy of "The Toy Story," which we enjoyed. We'll let oru many science fiction-fan friends hunt it down for themselves. Unfortunately, "unimaginable benefits," which this field certainly has, has not translated into corresponding funding—one of the great Catch-22 paradoxes of all time.—EFM

• — • — •

Congratulations are due you and your associates of *IE*! I know you have been urging CETI and others to take this first step toward commercialization of Cold Fusion. With the CETI announcement of the availability demonstration cells, the dike has sprung a leak that a legion of Dutchboys cannot plug.

You might also like to know that Cold Fusion is becoming infused in the public psyche. Last night while watching a Fox TV movie, "Alien Nation - The Enemy Within," I picked up a reference to CF. The heros were investigating the death of a Newcomer (alien) who worked in a toxic waste disposal area. While walking through a maze of pipework, one was heard to comment that there was no danger from the toxic compounds because they were being purified by a "Cold Fusion Process"! I found this amazing because this movie aired on the day following the announcement by CETI of their uranium and thorium "de-activation process" patent.

Keep up the excellent work! I treasure every issue of your publication. Your advocacy of Cold Fusion is a service to Humanity!

Terry Blanton, P.E.
Atlanta, Georgia

Thanks for bringing that TV episode to our attention—and thanks for your appreciation. Yes, we notice positive references to cold fusion in the general media from time to time. One was a TV ad for the (GM) Saturn automobile—unfortunately we did not get a tape of it!—EFM

• — • — •

The background of this letter was the unanimous vote by the faculty of the Department of Chemistry not to allow Professor Bockris to hold the Second International Meeting on Low Energy Nuclear Reactions on the Texas A&M Campus (Infinite Energy, Issue #9, p.18). Consequently, it was held off-campus in a Holiday Inn.—EFM

Edmund Storms, Ph.D.
270 Hyde Park Estates
Santa Fe, New Mexico, 87501

October 1, 1996

Dr. Emile Schweikert, Head
Department of Chemistry
Texas A & M University
College Station, TX 77843

Dear Dr. Schweikert:

The meeting about low energy transmutations, organized by Prof. Bockris, has created a level of controversy at Texas A&M that I' m sure you have grown tired of by now. Nevertheless, I would like to add a few comments.

The issue, as I see it, is not whether cold fusion or transmutation is real. This question will be resolved by the usual debate that goes on within the scientific process. The issue raised at Texas A & M is much more important because it addresses how this debate should be carried out. At the heart of the issue is the question, "How much freedom should be given at a university to hear about information that conflicts with established belief?" This question is difficult to answer when it concerns religion or politics. It is usually not raised to such a level of uncertainty when science is involved. When this happens, the very competence of the university can be questioned.

Those of us who are actively investigating the phenomenon are not as naive or as blind as the more skeptical members of the profession would have you believe. However, if the field is to be investigated with any hope of finding the truth, a benefit of doubt must be given even to what may seem to be outlandish claims. After all, if even a small fraction of the observations are correct, major changes in our present theories would be required. It is still too early to tell which of these outlandish claims will fall outside of the new theories— hence all are given a home. Every good experimentalist throws nothing away until sense is made of all that is observed. For a scientist to do otherwise would raise questions of personal competence.

The observation of "siege mentality" has been raised by some critics. I find this attitude very odd and a little insulting. To them, there are no scientific issues to discuss because the claimed phenomenon is, in their minds, not real. Consequently, they can only attack the people who are attempting to understand the observations. Over the history of science, this small-minded process has been repeated many times. How often must our profession repeat the same mistake? I, for one, would rather be searching for a new "truth" rather than attacking others because they did not believe in mine. Apparently, only a few faculty at Texas A&M share this attitude.

Sincerely,
Edmund Storms

Cy: Prof. Bockris

••••••••••ERRATA••••••••••

In *Infinite Energy*, Issue #9, in our report on the work of Professor John Dash (p.12) we misplaced a decimal point. The 0.6 gram cathode referred to should have been 0.06 gram. The 0.06 g represents about 20 watts of excess power per gram of cathode. Thank you, Prof. Dash!

—EFM

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CETI's Table-Top Research Nuclear Reactor for New Hydrogen Energy Studies Now Commercially Available.

Radioactivity Reduction Patent Approved.

It was a very big week for cold fusiont beginning Monday , November 11th. No it wasn't Armistice Day to end the Cold Fusion War, but maybe close!

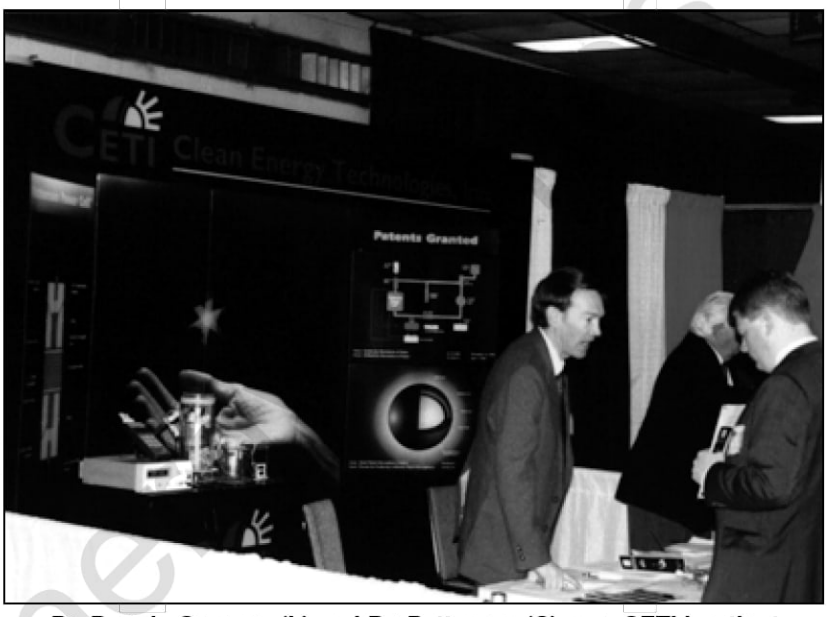
Clean Energy Technologies, Inc. (CETI) of Dallas, Texas began to lease demonstration transmutation/cold fusion cells at the American Nuclear Society Meeting — "The Global Benefits of Nuclear Technology"— at the Washington, DC Sheraton hotel.

That week, CETI's CEO James Reding stated that the company had leased some 40-plus kits already at $3,750.00/year each — about one-third of those kits being called for at the Washington meeting. Though there is no question that kts were leased, these figures might be somewhat inflated—"keen interest" or "serious intentions to lease" might be what the numbers represent.

The demo cell in Washington had microspheres with ceramic substrates, designed to achieve temperatures up to 500 C. However, the cell at the meeting was only running at 5 watts thermal energy out with about 1.5 electrical watts in, just to show proof of concept. This small level of heat is designed to let researchers draw conclusions about the correspondence of the transmutations to the excess heat. It is not optimized for power production, said Reding.

Possibly the biggest news—other than that there are now at least several groups who will have commercially leased cells -- is a new US patent that the USPTO has notified CETI that it has allowed. The patent will be issued within the next few weeks, according to reding. It is titled: "System in Electrolytic Cell and Method for Producing Heat and De-Activating Uranium and Thorium by Electrolysis"

This patent describes a method by which radionuclides are inserted into a special matrix designed for radioactive elements. According to Reding and inventor Dr. Patterson, with whom I also spoke, "conservatively" they have demonstrated the reduction by up to 50% of the radiation activity from uranium and thorium. The process takes only from 2 to 24 hours. Generally, the process occurs within only 4 hours. It is said that the de-activation can be as high as 90%, which would make for a pretty conclusive finding, I would assume. Anyone in the nuclear industry who can verify this result ought to conclude that we are "no longer in Kansas"—far from it.



Dr. Dennis Cravens (L) and Dr. Patterson (C) man CETI booth at American Nuclear Society Meeting in Washington, D.C., November 11-12, 1996.
Photo: Mike Carrell

According to CEO Reding, "an organization has already purchased the exclusive world rights" to license and sub-license this patent. The organization has arranged to pay CETI $1 million dollars ($1,000,000) for this. The organization's identity, for now, is private.

Jim Reding reports that response at the ANS meeting was very polite. He said there was a lot of interest in this technology among those who were initially skeptical. Reding reports there was great interest in Prof. George Miley's transmutation paper. Prof. Miley, of the Department of Nuclear Engineering at the University of Illinois and editor of *Fusion Technology*, has been given a slot at the American Nuclear Society meeting in June to deliver his latest findings. [A preliminary version of Dr. Miley's and Dr. Patterson's transmutation paper was published in *Infinite Energy*, Issue #9 — printed in October 1996.]

Mike Carrell of New Jersey, who has been a great help as a consultant to *Infinite Energy*, drove down to Washington to witness history-in-the-making. He filed a brief, informal report, in part:

"Interesting items in the order form (more of an application!) are questions about the instrumentation available (EDX, SIMS, NAA, SEM, Auger(AES)), and the statement that the kits will be delivered at the on-site training seminar, University of Illinois, December 10, 1996. In other words, dilletantes and the curious need not apply.

"A small working cell was in the corner, a Dewar with a bunch of tubes stuffed in it, wires coming out, circulating pump running in box next to it. Not dressed up, a few degrees delta-T, a few watts; Denis Cravens was very casual, almost dismissive about it (In spring '95 it would be a highlight!) Oh by the way, it used the beads with the ceramic cores."

"More prominent, on the table, was a picnic cooler with three tubes coming out in loose association with a bracket, a RIFEX cell, and a vial with extra beads in a liquid. The cooler and tubes were essentially mockups, since they (tubes) were of vinyl and the real kits would use teflon and ultra-clean details to avoid contamination. The cell itself was very well-built of teflon and could be pressurized.

"Reding told me he had wanted to get kits out earlier, but he had to nail down intellectual property positions before doing

New Energy Archive

so. The singular thing for CETI was simply to be at the show, in the 'lion's den.' There are some 20 patents in the works now, with the one on the transmutation process about to issue. Attendees at the show ranged from doubtful to 'I knew there was something to it' among the academics; the business people seemed more positive. Some 20 more kits [may] have been sold at the show. There were few people about when I was there, which was lunchtime, more were around yesterday. What Reding wants to do with the kits is to get techncal staff people familiar with the technology. And, of course, when the transmutations are seen in every quarter, the paradigm will begin to crack. He seemed to feel the heat was a secondary issue at present.

"ABC Television was in and did some tape for later showing; time unstated.

"I noted other claims for radioactive remediation to Patterson, who replied that the others had not produced enough data to get a patent; apparently CETI has been like the proverbial duck, drifting calmly on the surface, but paddling furiously underneath for the past year. He noted that the polymer beads sublimed, not melted, at elevated temperatures. The sublimation can be at least partially suppressed in a pressurized cell, and he has operated at (I think) 130°C as stated in his patent."

"Cravens in a conversation with a visitor (apparently student) from MIT noted the absence of fast neutrons and gammas from the cell, but said that a GM tube would give an indication somewhat above background, and that beads dumped from and active cell onto x-ray film would leave autoradiographic traces. So the radiation isn't zero, but sounds like what you would get from your TV set without the thick lead glass in the faceplate. Cravens also said there was a lot of work yet to do before one could have, say, home water heaters, to assure safety in operation and, for instance, disposal down a drain (not that he was proposing such). Cravens said that in the radioactive remediation, the beads were removed and the target material substituted in another form, which I took to be granular.

"It seems so obvious in retrospect, once you get past the fixation on the coulomb barrier: Stuff the metals full of extra protons so everything isn't fixed, and let the mix find its minimum energy configuration, which will be a mix of stable isotopes, and it is done without a lot of fuss, namely hard radiation. But slam it in an accelerator and everyone gets fussed up and goes into a radioactive sulk. (How's that for hifalut'n fizzics?). "—*Mike Carrell*

The following is the text of the Clean Energy Technologies Brochure:

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February 27, 1996 #5,494,559
Patent: System for Electrolysis of Liquid Electrolyte
December 13, 1994 #5,372,688
Patent: Method for Electrolysis of Liquid Electrolyte
June 7, 1994 #5,318,675
Patent: Metal Plated Microsphere Catalyst
July 30, 1991 #5,036,031
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July 24, 1990 #4,943,355
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Review of the Sixth International Conference on Cold Fusion ICCF6

by Jed Rothwell

Above: Shrine in front of the New Hydrogen Energy (NHE) Laboratory in Sapporo, Hokkaido, Japan– Made brief appearance in BBC's "Too Close to the Sun"
Right: ICCF6 Conference Hall at gala Apex Toya Hotel at Lake Toya *Photos: EFM*

MY OVERALL IMPRESSIONS OF ICCF6

Overall, my impression of the field of cold fusion as it represented in these big international physics conference is . . . that it is going to hell in a handbasket. It is moribund, just as Morrison and others predicted it would be by now, but not for the reasons they predicted. The number of attendees has drastically declined to 175 people, the quality of the papers is down, and little progress has been made toward technologically useful devices. While some workers report large improvements, many others report no excess heat or any other sign of a CF reaction.

In my previous reviews of ICCF3, 4 and 5 I have described grave misgivings about the direction of the field. In my review of ICCF5 I wrote:

"Many of the papers were disappointing, because many workers are stuck in the rut of trying to replicate the 1989 simple palladium - heavy water electrolysis method. This requires high loading and other conditions which are nearly impossible to achieve. Why anyone would still be trying to use this method so many years after better methods have been invented is a mystery to me . . . [T]he majority of scientists in the field ignore these promising approaches and continue using only palladium. Instead of selecting the easiest and most successful methods, they insist on using the oldest, least effective, and most frustrating technology, as if they were computer scientists who insist on building a vacuum tube machine in the age of transistors . . . Six years of low level results have failed to convince mainstream scientists that CF is real. Six more years will not convince anyone either . . ."

I can report that the situation is still like that, only worse. It turns out that even one more year of puny results was too much for the Japanese establishment. The whole program in danger of being shut down, and cold fusion in Japan — the last bastion of large scale research — is in imminent danger of collapse. Frankly, if I were in charge at MITI, I would have shut it down the main programs last year, and handed out the remaining funds to researchers who have achieved technologically significant results. If you are looking for the people to blame for the demise of cold fusion, in the U.S. you can point the finger at the pathological skeptics and the DoE. In Japan, you can blame the project managers and scientists at places like the NHE lab and IMRA Japan. The NHE did more than 50 experiments in a row with no success, and IMRA Japan did 32 experiments without success. They have ignored the literature. They have ignored improved techniques and alternatives. They make the same mistakes year after year. I do not know what causes this behavior. Perhaps they are closed-minded, timid, conservative, or locked into a bureaucratic plan written years ago by project managers who have no experience in the field. These scientists seem to think they will be funded forever even if they produce no results, in a miniature version of the hot fusion pro-

Conferees "Fuel-Up" at ICCF6 Opening Reception Apex Toya Hotel at Lake Toya *Photo: EFM*

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gram. Some even say this is how science is supposed to work, as if progress doesn't matter! Politics is partly to blame. Officially, the NHE was supposed to cooperate with the universities and with successful researchers elsewhere, but people outside the program tell me that the managers have scotched all cooperation. Whatever the causes, the outcome is tragic folly.

I wrote an open letter to the NHE directorate decrying the situation (see page #). In it, I cite 16 published papers and one private communication from Pons showing errors in the NHE experimental materials or technique. I circulated this Open Letter, and I have improved it thanks to valuable comments and suggestions from many people. I have translated it into Japanese and I have sent copies to the NHE, MITI, and to various Japanese newspapers and scientific journals. I do not expect the letter to have any effect, but I feel a social responsibility to write it. I want to go on record, sound the alert.

Frankly, I feel that we, the supporters of this field, have been pussyfooting around for too long with inept researchers, and making too many excuses for them. The cold fusion effect is said to be exceptionally difficult to replicate. I do not think so: I think many of the people who are trying to replicate are doing slipshod, unprofessional jobs. They have not made a concerted effort to learn the techniques of successful scientists like Storms. They have not done serious, careful, step-by-step replications of successful cells. At this conference, the French Atomic Energy Agency described their successful replication of Pons and Fleischmann's 1992 boil-off results. They followed the directions, used the proper materials, and they got repeated, large bursts of excess heat with a performance profile remarkably similar to the original experiment. SRI also made a concerted effort to replicate this experiment, and they reported similar success. So it can be done right.

Some people do not see the 50 failed NHE experiments as a disaster. Dr. McKubre said he can learn from the data. MIT Prof. Hagelstein told me I am much too harsh and the results have scientific value. Storms thinks the technical points in my Open Letter are sound, but the tone is too emotional and strident, making the letter counterproductive. Others, including Fleischmann, Mallove, Bockris and Mizuno agreed with me.

FLEISCHMANN RETIRED, ALIENATED

Martin Fleischmann has retired from active research and returned to England. He was originally scheduled to give a one-hour keynote lecture at the conference, but this was canceled. I asked him why. He replied he "has already said everything there is to say." He feels alienated from mainstream research in the field, which he thinks is politicized. He feels that people have not listened to his advice and ideas. I told him that people do not understand him because his lectures are so technical and because he sometimes talks in "riddles," like the Delphic Oracle. I said the message does not get through, so he should consider writing a paper in collaboration with someone who communicates in simpler, more understandable prose.

George Miley (L) and Martin Fleischmann *Photo: EFM*

Stanley Pons of IMRA Europe, SA (R) and Kikujiro Namba of Technova, Inc.
Photo: EFM

PLENTY OF GOOD NEWS TOO

I should not grouse too much. There was good news, and even some outstanding news. Here are some of the papers that impressed me. They are listed by Abstract number, principal author and title. Abstracts are numbered O (oral) 1 to 44, TS (transmutation session) 1 - 7, and P (poster) 1 - 79.

In my opinion the two best papers were from Miley and Pons.

O-019 G. Miley, *"Experimental Observations of Massive Transmutations Occurring in Multilayer Thin-Film Micropheres After Electrolysis"*

This was similar to Miley's lecture and paper given at the Second International Low Energy Nuclear Reactions Conference (ILENR2), discussed here, and published in *IE* #9. Miley showed some additional data strengthening the observations of three zones of transmutation. He explained that zones are characteristic of fission reactions. He showed data for beads with glass cores. These produced little heat and only a small number of apparent transmutations, with large sections of the spectrum flat compared to the plastic core beads. In conversation, he explained that the make up of the beads was different in each of the twenty runs. Some came from CETI while others were fabricated at the University of Illinois. Some had multiple layers of nickel and palladium, some were nickel only, and thickness was varied. He said he sees no point in doing the same experiment over and over. He wants to explore a variety of materials and thin film configurations.

Several companion papers about the CETI device were scheduled for the same hour that Miley talked, but only one was delivered. Some of the authors, Cravens, Nix, and Claytor, did not show up at the conference. This was good and bad. Good, because it gave Miley more time. The conference organizers had scheduled a one hour for the CETI session, giving Miley only 15 minutes. It was bad because the other papers apparently include vital information about the CETI cell, judging by the footnotes in the Miley paper and the titles of the missing papers: "Electrical Control of New Hydrogen Energy," "Design Considerations for Multilayer Thin-Film Patterson-Type Microspheres," "Producing Excess Enthalpy . . . with Near 100% Reliability" and so on. CETI did not explain these last minute cancellations and other sudden changes in their plans. They missed a good opportunity to get their message out and excite interest in their technology, but they made up for it a month later, at the American Nuclear Society meeting in Washington.

One other paper about the CETI cell was

M. Srinivasan (L) of Bhabha Atomic Research Center, India and Daniel Gozzi of University of Rome. Gozzi's group confirmed heat-related helium-4 production and x-radiation from cold fusion cells.
Photo: EFM

given, by **McKubre:**

O-020 *"Electrochemistry and Calorimetry in a Packed-Bed Flow-Through Electrochemical Cell."*

This was a sophisticated analysis of the electrochemistry of a Patterson-style cell. McKubre showed that the most active and highly loaded beads are probably those at the top of the bead pack near the anode. He concluded that the best way to scale up a Patterson cell would be to increase the diameter, making a broad, flat bead pack with just a few layers of beads. Patterson himself has reached the opposite conclusion. Before McKubre's talk, I asked Patterson how he plans to scale up his cells. Patterson said he will make them long and thin, adding many layers of beads. McKubre and Patterson should get together and hash this out.

O-014 S. Pons, *"The ICARUS 9 Calorimeter: Summary of Three Years Designing, Testing and Operation of this Device at the IMRA Europe Science Center"*

The paper describes a cell that was held at boiling for long periods, producing 200% excess at hundreds of watts. Cathodes are either 2.5 cm long (0.075 cc, 0.9 g) or 10 cm (0.3 cc, 3.6 g). In a 3-month run this cell produced 294 megajoules from one cathode. The calorimeter is rather complex. It is static design, requiring three calibration curves from three thermocouples to measure low, medium, and boiling level power levels. Pons showed extensive data from a huge number of different types calibration runs. Several people said they thought this calorimeter is a little too complicated, and inappropriate for this power and temperature domain. It was suggested that a Seebeck thermoelectric envelope design would be better.

O-001 P. L. Cignini, D. Gozzi, et al., *"X-Ray, Heat Excess and ^{4}He in the Electrochemical Confinement of Deuter-ium in Palladium"*

Excess heat, helium and x-rays were observed. Helium was measured by drawing off samples of gas, filtering out everything but helium, and putting the gas into a QMS (quadrupole mass spectroscopy) chamber integrated into the experimental apparatus. In a four-cell experiment lasting 950 hours, more than 1000 samples were taken from each cell. At first glance, the helium did not appear to be correlated with heat, but a sophisticated statistical analysis, taking into account the sampling periods and percent of total gas in one sample, shows that did actually appear together. The curves for helium change completely after the complex statistical massaging. X-rays were measured with x-ray film positioned 5 cm from the cell. X-ray film placed next to a Pt blank cell showed no fogging. Film next to Pd cells that produced heat were fogged, with a shadow where the anode blocked the cathode. A sophisticated microscopic analysis of the film was performed, based on the physics of film and comparisons to film of the same stock exposed to known levels of x-rays. It was concluded that the "energy of radiation" (the power of the x-rays) was 89 ± 1 keV and the total energy intercepted by the film was 12.0 ± 0.4 kJ.

This experiment contributes nothing to reproducibility, which is the main problem of cold fusion. Excess power levels were low in absolute and percent terms, so it has no immediate technological significance. The sigma level for the heat was high. The x-ray energy levels and helium may contribute to a theoretical understanding, and they prove that the heat cannot be of chemical origin. The instrumentation is superb, so it is hard to see how anyone could quarrel with the results. However, D. Morrison did quarrel, insisting that an x-ray detector would have been better than x-ray film. He said that Steve Jones offered to lend one to any CF scientist and he cannot understand why nobody has taken Jones up on the offer. Gozzi replied that he did not think a detector would work in this configuration, and that the physics of x-ray film are well understood.

Gozzi's cathode is a bundle of palladium wires, rather than a single block of palladium. This increases surface area.

O-005 E. Botta, *"Further Measurements on ^{4}He Production from PdD_2 Systems in Gas Phase"*

Another solid job from the Italian university and INFN (Italian government Nuclear Physics Laboratories). They showed more evidence for helium production in one run. They use an interesting technique to achieve high loading. Deuterium gas is loaded into palladium plate under pressure, and "a constant electric field of a few hundred millivolts per cm" is applied from one edge of the plate to the other, which moves the deuterons across it by electromigration. The ends of the plate are sealed with gold, and I think this causes the deuterium to "pile up" against the ends. This electromigration technique was used by several other Italian workers to enhance the CF effect, and it is the basis of the proton conductors used by Mizuno, Biberian (ICCF-5), Oriani, and Karabut (P-001). With a proton conductor, you charge both sides of the plate (rather than the ends). If you leave a direct current charge running continuously, one side of the plate would become highly loaded with deuterons but the other side would not, so you use a square wave current that alternates every minute or so, charging first one side, then the other. Mizuno and others speculate

Francesco Celani of INFN (National Institute of Physics), Frascati, Italy—Electromigration work with thin wires boosts power dramatically.
Photo: EFM

that this also causes the deuterons to "slosh around" inside the conductor, occasionally piling up in local spots at a loading ratio much higher than the average for the entire conductor, which causes a powerful CF reaction in that isolated spot.

O-015 F. Celani, *"High Power Microsecond Pulsed Electrolysis Using*

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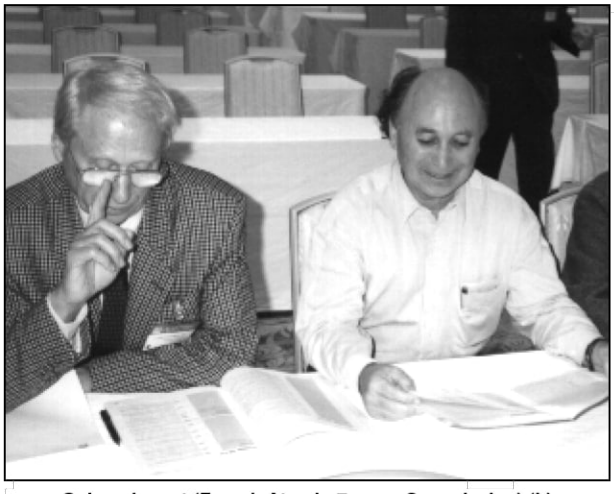

G. Lonchampt (French Atomic Energy Commission) (L) and Jean-Paul Biberian—Reported exact replication of the Pons & Fleischmann boiling cell work.
Photo: EFM

Long and Thin Pd Wires in Very Diluted LiOD-D2O Solution: Observations of Anomalous Excess Heat"

This was another interesting electromigration experiment, which was first described at ICCF5. Considerable progress has been made since then, with better results and improved flow calorimetry.

O-016 S. Storms, *"Some Thoughts on the Nature of Nuclear-Active Regions in Palladium"*

This covered much of the same ground as the paper published in *IE #* 8, p. 50. An interesting aspect of this paper is the Open Circuit Voltage (OCV) method of measuring loading, which Storms recommends. Many electrochemists recommend this, including Bockris in his recent letter to the NHE. It involves the use of a platinum wire (a "reference electrode") set inside a small glass straw (a "luggin capillary"). The end of the capillary fits between the anode wires. It can be held close to the cathode, making a conduction path between the reference electrode and one spot on the cathode. To measure loading, electrolysis power to the cell is temporarily turned off, and the voltage difference between the cathode and the reference electrode is measured. Because the cathode and the reference electrode are different metals, they have different electrochemical potential. When he begins the experiment, Storms measures 0.00 to 0.02 volts. As the palladium fills with hydrogen, the electrochemical potential changes, the voltage goes up. Strictly speaking, the OCV measures chemical activity on the surface, not loading per se. After a highly loaded cathode reaches saturation, the OCV sometimes continues to rise to much higher levels than normal, reaching 1.3 volts, even though the cathode is probably not absorbing any more deuterium. This is a good indication that the cathode has entered the special state of matter (or "the special state of grace") in which the CF effect can occur. Another indication of this special state is seen when a cathode degasses over an hour or so. The OCV falls, then rises again briefly after about 30 minutes, then resumes its decline. Outgassing is steady, it does not reverse and rise briefly, so the OCV must be decoupled from the loading ratio. When it reaches these abnormally high levels, the OCV is no longer a reliable measure of loading, but instead it indicates some other poorly understood state of the cathode. This poorly understood state just happens to be exactly what you are want: metal-ready-for-CF.

O-055 G. Lonchampt, *"Reproduction of Fleischmann and Pons Experiment"*

This paper was presented by Biberian because Lonchampt does not speak English well. It describes a marvelous series of experiments performed by French Atomic Energy Commission (CEREM), in association with the ENSEEG (Ecole Nationale Superieure d'Electrochimie et d'Electrometallurgie de Grenoble). Biberian also worked on the project, although he is not listed as an author. Lonchampt is a CEREM commissioner, and an engineer not a scientist, (thank goodness). These experiments are exact replications of the 1993 boil-off experiments reported by Pons and Fleischmann in *Physics Letters A* 176. This is exactly what cold fusion cries out for: careful, step by step replications done by people who follow directions. Biberian said that he and the other scientists in the project wanted to incorporate various "creative improvements" but Lonchampt insisted on doing a precise replication with assistance from Pons and Fleischmann. That is why it worked, as Biberian cheerfully admits. It takes an engineer to do these things right. Everything about this work is superb, even the Abstract. Let me quote it extensively:

"Experiments have been performed in calorimeters identical to the ones used by Fleischmann and Pons . . . [T]hese experiments can be analyzed in three temperature domains:

- At low temperatures, below 70 deg C, excess enthalpy is the difference between the heat radiated to the water bath, and the enthalpy input due to electrolysis.
- At intermediate temperatures, between 70 deg C and 99 deg C, excess enthalpy is the difference between the heat radiated towards the water bath plus the enthalpy contents of the gas stream, plus the variation of enthalpy of the contents of the calorimeter . . .
- In the boiling regime (without condensation), excess enthalpy is calculated from the difference between the total amount of water contained in the calorimeter evaporated and the theoretical quantity of water that should be evaporated by the energy introduced in the calorimeter . . .

Six calibration runs with platinum cathodes and 17 runs with different palladium type cathodes have been performed.

At low temperature, 8 experiments have produced an excess energy rate between 1 and 5%. In the intermediate regime the water vapor carried away by the gases of the electrolysis are large, and cannot be evaluated precisely . . .

At boiling, three positive experiments have been successful, giving excess enthalpies rates of 80% to 150% . . .

In conclusion, we confirm the results published by Fleischmann and Pons more particularly in the boiling regime."

The Abstract says "at boiling, three positive experiments" but a table shown during the lecture listed five. Here are the last two columns, showing excess heat a percent of input before boiling and during boiling:

Before	During	
16 %	153%	
-0.2 %	0 %	With a platinum null electrode
3 %	18 %	
7 %	36 %	
20 %	97 %	
7 %	29 %	

Other runs with palladium generated no excess heat. The conclusion presented during the lecture was: "The Fleischmann-Pons calorimeter is very accurate and well adapted to this work, however several precautions must be taken. The Dewar must be of excellent quality. Calibration of the thermistors must be very precise. Care must be taken to minimize the thermal losses by heat conduction. All electrical feed-throughs must be sealed off . . ." Finally, below 70 deg C there is sometimes a small level of artifactual excess heat "due to heat conduction not included in our equations." Pons and Fleischmann do take these factors into account in their equations. In any case, the excess below 70 deg C is marginal, just as Fleischmann has been saying all these years.

This project is continuing. They plan to build larger cells to avoid spilling, and cells with condensers like IMRA Europe's

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Martin Fleischmann (L) discusses Triode-Configuration Cold Fusion Cells with developer Evan Ragland
Photo: EFM

ICARUS 9, for experiments with continuous boiling.

P-004 S. Crouch-Baker, *"Mass Flow Calorimetric Studies Under Non-Steady State Conditions"*

SRI also did a quality replication of the Pons-Fleischmann boil-off experiment. They used high precision equipment and extensive modeling to examine the power levels just before boiling ensues, and during boiling. The goal was to answer an interesting chicken-and-egg question. Does the heat cause the CF reaction, or does an increasing CF reaction cause the heat? It could be a combination of the two, what Fleischmann calls "'positive feedback' between the temperature and the rate of excess enthalpy generation." SRI concluded that the cell begins to heat up because of normal electrochemical processes. The cathode surface changes, resistance rises, more power is consumed, and the temperature rises. You can accomplish the same thing with a platinum cathode. You can even drive a platinum cathode to boiling with this mechanism, but you get no excess heat. With fully loaded palladium however, the temperature rise triggers a burst of excess heat. I conclude that you should be able to trigger a CF reaction in fully loaded palladium by raising the temperature by some other means, like raising the temperature of the incoming electrolyte in a flow calorimeter, or perhaps even by heating the cathode with a laser. It would be interesting to find out if this works.

P-016 E. Ragland, *"Triode Cell Experiments for Controlled Fleischmann /Pons Effect"*

Ragland has been working on the triode configuration for cold fusion since 1989. We published a brief note about this work in *Infinite Energy* #3, p. 42. A triode is a cathode with two anodes: in the configuration he is now using, it is a 1 cm square palladium plate cathode, and two separately powered platinum wire anodes, one on each side of the plate. High power is shifted back in forth between the anodes for periods lasting from 1 to 16 seconds, usually 8 seconds. The low-power side anode is not turned off completely, because it would start degassing. This shifting back and forth apparently causes high deuteron mobility. This is the sloshing deuteron model described by Mizuno and Biberian (see the discussion of Botta, above). The method might also be compared to the high-low A. Takahashi loading.

Ragland had a cell running all summer.

Melvin Miles of the Naval Air Warfare Center, Weapons Division—Excess heat highly correlated with helium-4 measurements *Photo: EFM*

He says input was between 1 and 2 watts, the flow rate was 25 ml/min, and the Delta -T was generally 4 to 5 deg C, indicating total output of 8 or 9 watts. Over the past year he has tested four palladium plates from Johnson Matthey. All four successfully generated heat at about the same level.

Ragland says that after the cell begins working, he can progressively cut the purity of the heavy water until it is down to about 20%, and the heat continues. That is the first time I have ever heard that claim! It's extraordinary if true. It is one of several aspects of the report that make me nervous. I must see independent testing of this device before I can accept it.

Fleischmann was impressed by this work. I listened to his conversations with Ragland. He said, "this [triode configuration] is something I have wanted to try for years." He thinks a cylindrical cathode might work well. A wire going down the center of the cylinder would constitute one anode, and a wire wrapped in a spiral around the outside would constitute the second one. Biberian was also impressed with this design. He said he hopes to try it soon. **(See Accompanying Article, p.22)**

O-031 T. Claytor, *"Tritium Production From Palladium and Palladium Alloys"*

This was presented by Ed Storms, because at the last minute the DoE told Claytor he was not authorized to go to ICCF-6. It was similar to the paper Claytor gave at ILENR2, so I will not discuss it here. Claytor's presentations are lucid, but I found Storms even easier to follow. (Biberian, who presented Lonchampt's paper, remarked that perhaps we should arrange to have all papers given by someone other than the author!) One point brought out by Storms was the multiplicity of techniques used to make sure the tritium really is tritium. Storms said that this project has been peer reviewed at Los Alamos for several years running, and it has passed this review, which is much tougher than any journal peer-review, he said. Nevertheless, he said that "because of pathological skepticism," all funding for the project will probably end this year. Since the U.S. government is planning to spend $3 billion on a new reactor to generate tritium for nuclear weapons, the decision to terminate this program is a threat to national security and a fantastic waste of money.

Our *Infinite Energy* home page has a link to an earlier version of the Claytor paper. Considerable progress has been made since that version was written, by using alloys and by introducing a small amount of carbon dioxide into the chamber.

O-004 M. Miles, *"Heat and Helium Measurements Using Palladium and*

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Palladium Alloys in Heavy Water"

Miles always gives good presentations. His instruments and techniques are second to none. Unfortunately, this project has been terminated for lack of money, so many of the results reported here were old. However, some of his best results have not been reported previously because they came at the end of the project, using palladium alloys. Also, the calorimeter, which was already superb, was improved in the last year of the study, increasing the sigma level of the results. Quotes from Abstract:

"Our best experiments produced up to 30% excess heat, 0.52 watts of excess power, and 1,400 KJ of excess enthalpy..."

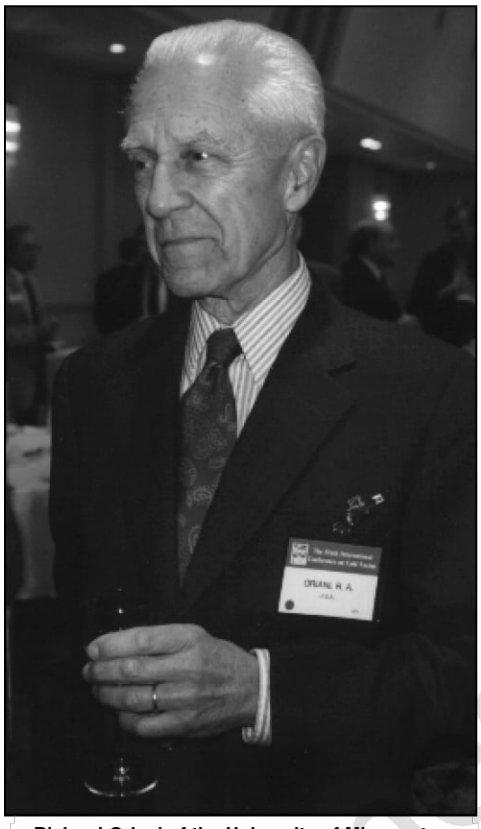
You might doubt these results coming from some labs, but Miles can measure 0.5 watts with as much confidence as most people measure 5 watts.

There is a remarkable correlation of excess power with the source of the palladium. The best reproducibility was obtained using Pd-B materials supplied by the Naval Research Lab. Seven out of eight experiments that used Pd-B cathodes produced excess power. A high success ratio was also obtained using Johnson-Matthey materials. Seventeen out of twenty-seven experiments that used this palladium source produced excess heat. In contrast there were several palladium sources that never produced excess power in any experiment.

That is an important observation! Materials are key to cold fusion, as everyone aught to know. Perhaps a clever technique like Ragland's triode cell can transform any Pd or Ni sample into a good one. (Ragland thinks so.) But if that is not the case, then the only way to improve reproducibility is to focus on materials: the cathode, anode, electrolyte, lead wires, glass, and everything else that goes into the cell.

The main purpose of Miles' experiments was to correlate helium in the gas stream with excess heat production. Quote: "Thirty experiments have shown a correlation between either excess power and heat production or no excess power and no excess helium . . . The only valid experiments that showed significant excess power by no excess helium involved a Pd-Ce cathode. The odds are less than one in a million that our complete set of thirty-three heat and helium results could be obtained from random experimental errors." I asked him where he thinks the helium from that Pd-Ce experiment is. He said it is probably still inside the cathode, or it leaked out gradually after the experiment.

O-036 R. Oriani, *"A Confirmation of Anomalous Thermal Power Generation from a Proton-Conducting Oxide"*



Richard Oriani of the University of Minnesota—Confirmed excess heat in ceramic proton condutors
Photo: EFM

Oriani is working with proton conductors that Mizuno fabricated by hand. Neither he nor Mizuno has seen the dramatic heat bursts that Mizuno observed years ago, but they do get significant excess heat and "heat after death." Oriani's best heat after death result was 0.8 watts lasting 17 hours. Oriani originally duplicated Mizuno's static gas calorimeter. He found that contamination from air and other gasses caused unexpected results that might be mistaken for excess heat. I do not think this could explain the tremendous heat bursts and melted solder connections Mizuno observed, but it does call into question the low grade heat produced by most of the samples. To get around this problem, Oriani built an excellent Seebeck calorimeter designed to operate at 400 deg C. (Proton conductors only work at high temperatures.) The design requires an internal heater that takes a lot of power, which unfortunately creates a lot of thermal noise, so the sigma is low even when the conductors produce a half-watt or so. However, two of the specimens "produced positive deviations from the calibration curve by more than four standard deviations . . ." Oriani concludes "verification of the claims has been achieved." This paper has been accepted for publication in *Fusion Technology.*

Oriani is sending some of his successful used cathodes back to Mizuno, who will look for evidence of transmutation.

Oriani plans to try a molten-salt CF device, like the one that produced a few bursts of heat at the University of Hawaii years ago. I wish he would stick with proton conductors instead.

O-035 T. Passell, *"Search for Nuclear Reaction Products in Heat Producing Pd"*

This is a work-in-progress, with no completely convincing results yet. Passell is looking for host metal transmutations, using prompt gamma activation analysis (PGAA). He thinks he has found an ~18% reduction in the ratio of boron-10 to palladium-105 in a cathode that generated excess heat at SRI. This just happens to fit a theory of his. It fits too well, enough to make you uneasy. Unfortunately, he has only looked for the boron and palladium ratio. He has not produced an entire spectrum of all elements and isotopes, the way Miley, Mizuno and others have done. I do not understand why not. I am dissatisfied with this work for another reason. Passell began by saying that he has a drawer full of cathodes from a variety of used cathodes and virgin material samples from many labs, not just SRI, but also IMRA Europe and the Navy. These cathodes were used in successful experiments, some of them highly successful. Yet he has only looked at one pair, and only for one transmutation. I expect he is sitting on a gold mine of information! Some of these cathodes produced thousands of megajoules per mole of metal. If Passell would hurry up and look under the surface layers, I expect he will find what Bockris and Minevsky found: areas of massive transmutation, where 70% of the palladium is transmuted into other elements, with unnatural isotopic distributions. This should be a top priority. I do not understand why this kind of research takes so long. When a dynamic worker like Mizuno or Miley decides to do something like this, he gets it done in a matter of weeks, where others seem to take months or years.

There were many other good papers. I wish I could describe them all, but I would end up reproducing a large chunk of the proceedings. J. Dash, Srinivasan, S. Crouch-Baker, Y. Arata, T. Mizuno, T. Ohmori and others presented interesting work. As always, I urge all readers to get the proceedings when they are published. Read original sources. (And *Infinite Energy*, too!) As always, I have ignored theory papers and highly technical papers, because they are over my head.

CLOSING SUMMARIES

At the end of the conference, summaries

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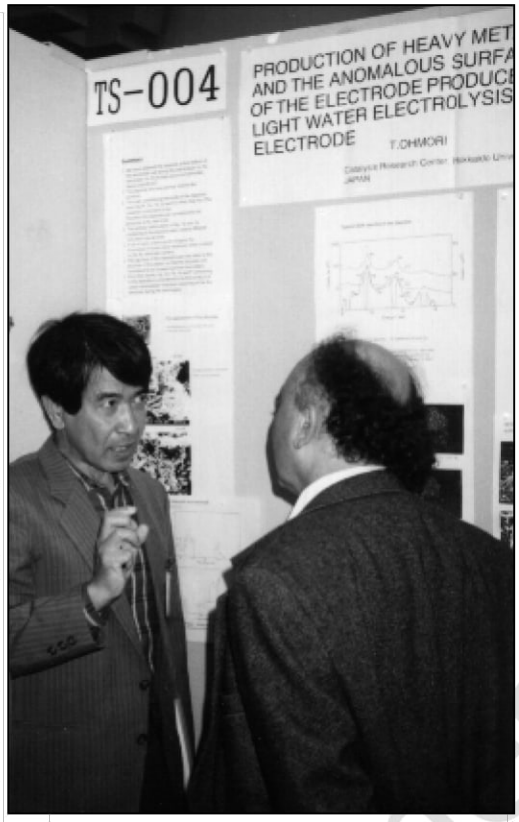
were presented by Bressani, McKubre and Ikegami. I found them excruciating. They were symptomatic of everything that is wrong with the field. Never have I felt so alienated from the cold fusion mainstream as I did listening to these talks. Don't get me wrong: these were carefully researched, quality presentations. The experimental evidence mustered by Bressani and McKubre cannot be disputed. But it is only the tip of the iceberg.

Bressani cited the increasing number and quality of experiments detecting helium correlated with heat, now at KEK, U. Osaka, Torino, China Lake and elsewhere. He concluded that the evidence of helium and x-rays proves beyond any doubt that cold fusion is a form of d-d fusion, in which all paths but the formation of helium are suppressed, and who knows what happens to the energy. I find this hypothesis just about as preposterous as Morrison must find it— for opposite reasons of course! Morrison is upset because this violates his holy textbook theories. I am upset because Bressani has dismissed a gigantic chunk of experimental evidence, from nickel and light water to the transmutations reported by Miley, Mizuno, Ohmori and Minevski, with much more to come soon, I expect. Bressani and most other scientists at the conference ignored Miley and other evidence for transmutations and anything else but d-d helium transmutations. At Japanese conferences people not only ignore Ohmori, they laugh at him. You would think that someone of Miley's status—after all, he is the editor of the American Nuclear Society's *Fusion Technology*— would command respect, especially from a group of scientists who have suffered from bigoted rejection by closed-minded mainstream scientists, but . . . alas, no.

Bressani concluded by saying how pleased he was that the conference attracted no attention from the press and "no newspapers." From my point of view the lack of publicity and the conference organizers' total disregard for public relations are two more nails in the coffin. Good press coverage leads to funding. No press coverage leads to oblivion. This is true of any branch of science, industry, fine arts, law or any other human endeavor. Imagine what the situation would be like if major newspapers were to report the fact that the French Atomic Energy Commission has fully replicated Pons and Fleischmann's high heat results! These results prove beyond any doubt that cold fusion has the potential to be technologically useful, if only it can be scaled up. If this news was broadcast by the major media, cold fusion funding would increase to billions of dollars per year and more



Tadayoshi Ohmori of the Catalysis Research Center, Hokkaido University explains transmutation results to Jean-Paul Biberian
Photo: EFM

Tadahiko Mizuno, Faculty of Engineering, Hokkaido University—Transmutation results resemble those obtained by George Miley
Photo: EFM

progress would be made in the next six months than we have seen in the last seven years. Yet the NHE and the scientists at this conference hide this light under a bushel, and try to prevent the media from learning about these results!

McKubre's presentation upset me because it was so good (see accompanying transcribed text). It was a brilliant analysis of problems he has been ignoring for seven years – problems pointed out to him many times by Fleischmann, Cravens, Dash and others, including me. This summary reminded me of McKubre's ICCF-4 presentation I cite in the *Open Letter*, in which he described a heat burst caused when the flow was accidentally blocked and the cathode temperature rose higher than planned. At that time, McKubre said "we should have listened more carefully to Martin at ICCF-3 when he talked about the importance of temperature." That is what McKubre said, back in 1994. Then he and the rest of the mainstream went on ignoring Martin for two more years.

McKubre began his summary by saying he is "pleased with the results of this conference" – a statement I find appalling. He said "I think the fire that was fueled by the fever of enthusiasm from the beginning, that has sustained many of the people in this room, has sort of resolved itself into a seriousness of purpose" He defined this purpose to "explain the phenomena, first to ourselves, then to the world." Others say *explanations* are not needed at this stage, just make the thing reproducible the way Miley and Storms are doing, and then *demonstrate* it to the world. He cited the helium and heat correlations, which surely are impressive and important. He said: "the transmutation products I think are the wild card in more ways than one. I just don't know how to assess the transmutation business. It is already spinning off mini-conferences of its own. Should that work hold up, it will certainly evolve to dominate future conferences." He cited more than 20 groups reporting excess heat. He described what he called "the mass flow calorimetry 'problem'," and he said what should have been said four years ago. The failed experiments at IMRA, NHE and SRI are all in SRI-style flow calorimeters. He cited his own model, in which excess heat is caused by loading, high current density and flux, and he said that an SRI-style flow calorimeter prevents flux. McKubre agreed with Celani's dictum: "You need to depart from the steady state." He added:

"With the mass flow calorimeter – the most sluggish and stable of animals – the hardest thing to do is to depart from the steady state . . . What we have done in part, partly in response to our critics [skeptics, not Fleischmann], is to make calorimeters in such a way as to improve the data quality. You improve the data quality by averaging things for a long time,

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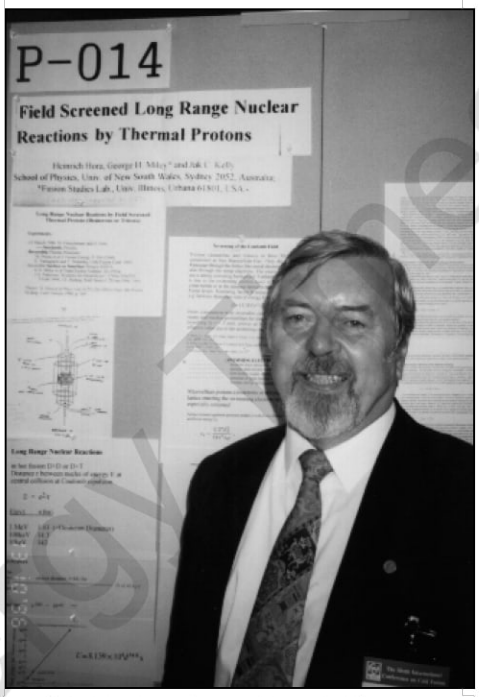
never changing anything. . . . so the lines on a viewgraph are very clear with few irregularities you have to explain. In doing that, of course, you maintain the system as closely as possible in a steady state. We have engineered our systems to do that. That is what flow calorimeters do well. I question, now, whether that is wise."

Great! He questions that now, three years after Pons and Fleischmann made it abundantly clear that steady state, low temperature conditions are the kiss of death. He questions it now: how many years will it take him, the NHE and the others to act on these newly expressed doubts? How long will Tom Passell leave those used cathodes in his drawer? He is hiding a great mother load of knowledge – an astounding scientific breakthrough – in a drawer, for crying out loud! Is this an incurable bad habit common to scientists? How many years did Newton hide the *Principia Mathematica* in a dresser drawer? I thought that to do basic scientific research you must constantly re-examine your ideas, fiddle with the machinery, build new instruments, and try new approaches. It should not take three years for people to listen to advice from Pons and Fleischmann. They are the leading practitioners of this field. They have reported the biggest, best, most dramatic and important results. SRI replicated the boil-off results. Why didn't they move to build a calorimeter like ICARUS-9, with a condenser, designed to operate at continuous boiling? As Franklin D. Roosevelt put it: "It is common sense to take a method and try it. If it fails, admit it frankly and try another. But above all, *try something*." Also citing common sense (that rare commodity), Bockris wrote to the NHE:

"One last thing, a matter of common sense, but it doesn't seem to be realized, and that is to stop going on with experiments that don't succeed. I learned from reports I got from Tom Passell, that IMRA did 28 experiments with zero results. That is absurd. After six or seven experiments, of course the method should be changed."

McKubre cited some of the exciting new techniques reported at the conference, and said he wants to try some of them, particularly electromigration, which spurs a departure from the steady state. "The take-home message from this conference, that I will act on immediately, is to reinvestigate, or re-re-re-investigate electromigration effects. We have started on this several times, found that it is very difficult to do, and given up." He said that Preparata's experiments with high voltage electromigration require courage. I asked him if he meant they take moral or physical courage. He said he thinks there is a distinct possibility that high voltage in such an electrochemically active cell will trigger an explosion, even without a large head space.

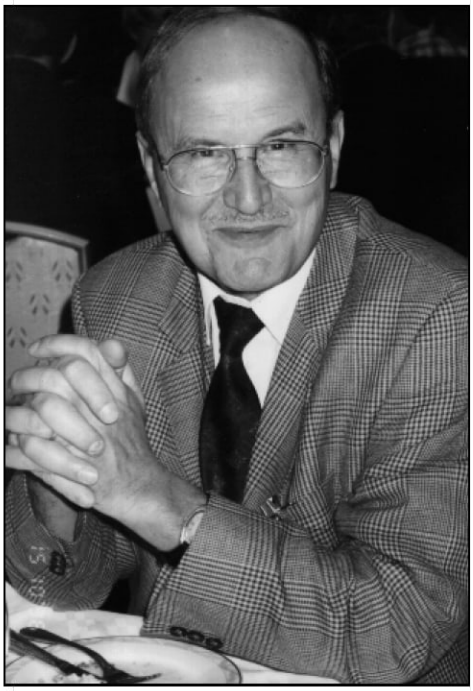
Ikegami concluded the conference by saying how pleased he is that these gatherings have "grown up to be normal scientific conferences." I say that if the field has reached maturity, it is suffering from progeria (the Hutchinson-Gilford syndrome), a horrifying, invariably fatal disease in which children starting at age three develop grey hair, high blood cholesterol, arteriosclerosis, senility and other physical changes typical of old age, resulting in death before the age of twenty.



Heinrich Hora, Dept. of Theoretical Physics, University of New South Wales, Australia— Developed with George Miley the "swimming electron layer" model to explain solid-state nuclear reactions
Photo: EFM

Yeong E. Kim of Dept. of Physics, Purdue University— a theory to explain solid state nuclear reactions. *Photo: EFM*

Scott Chubb of the U.S. Naval Research Laboratory, who with uncle Talbot Chubb (NRL, ret.) has pioneered the Ion Band State theory of cold fusion reactions.
Photo: EFM



Jacques Dufour, France— Excess energy production in hydrogen gas— thousands of times beyond chemical explanation.
Photo: EFM

6th International Conference on Cold Fusion

ICCF7
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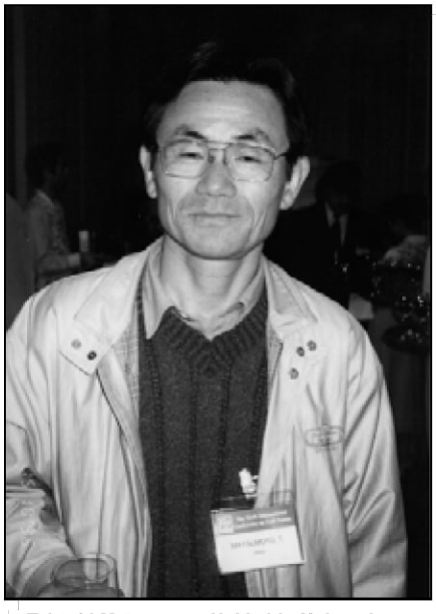
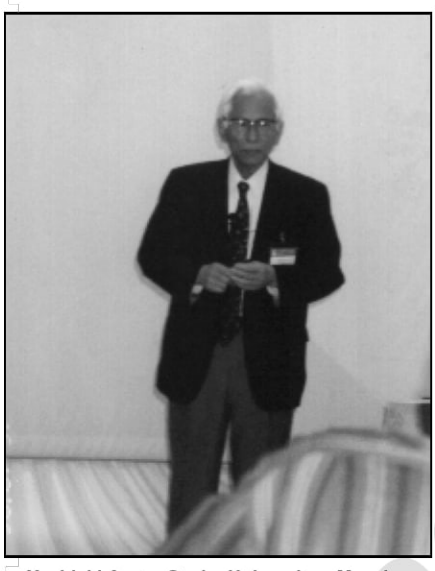


Takaaki Matsumoto, Hokkaido University—Has found numerous cold fusion anomalies. *Photo: EFM*

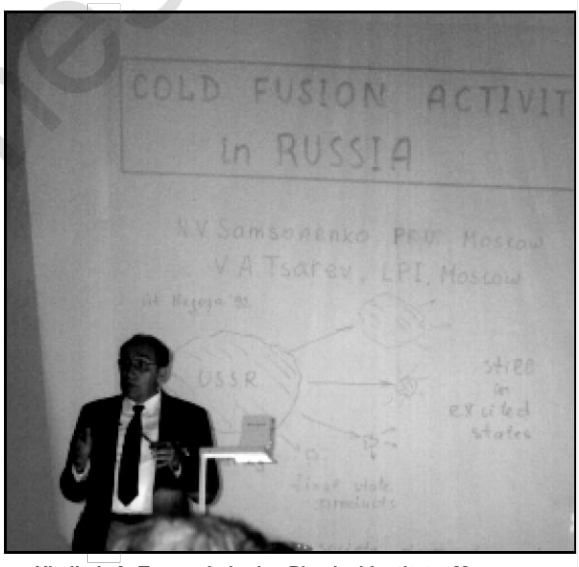
V.I. Vysotskii, Kiev Shevchenko University, Ukraine—Experiments suggest biological transmutations are real. *Photo: EFM*

"Natasha," the Russian-to-English translator— helps Alexander Samgin of the Institute of High-Temperature Electrochemistry, Ekaterinburg *Photo: EFM*

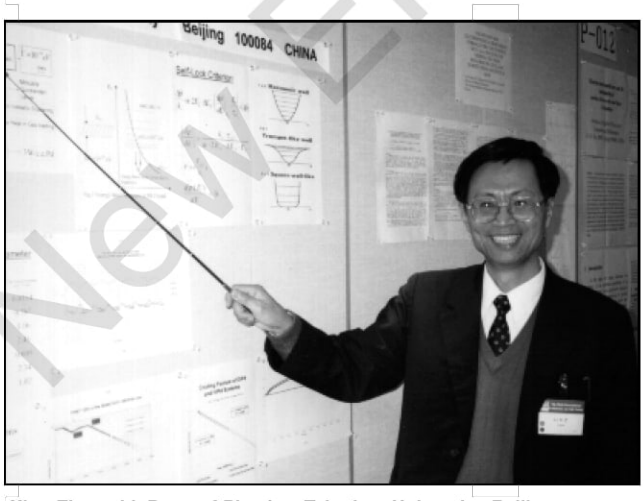


Yoshiaki Arata, Osaka University—Massive excess energy generation in "double cathode" configuration, plus helium-4. *Photo: EFM*

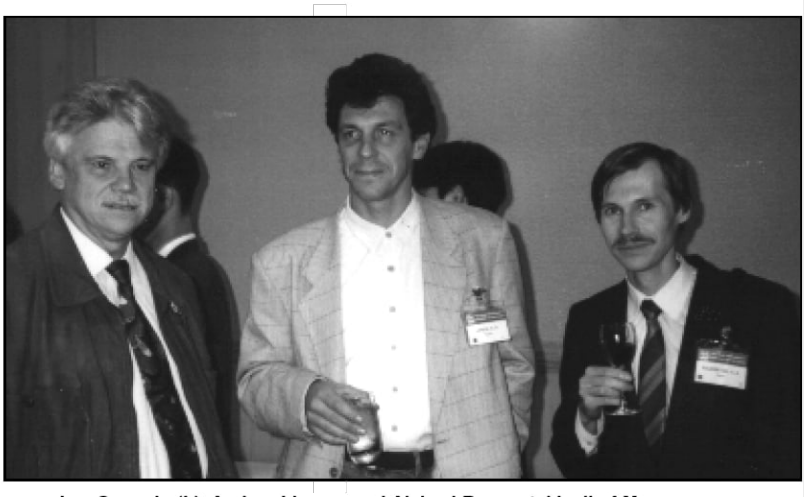
Makoto Okamoto, Tokyo Institute of Technology—Correlated neutron emissions with excess heat. *Photo: EFM*



Vladimir A. Tsarev. Lebedev Physical Institute. Moscow—Reviewed cold fusion activities in the "fissioned" former USSR. *Photo: EFM*



Xing-Zhong Li, Dept. of Physics, Tsinghua University, Beijing—Excess heat found in a simple gas-loaded system. *Photo: EFM*



Lev Sapogin (L), Andrey Lipson, and Aleksei Roussetski, all of Moscow—widespread interest in cold fusion in Russia. *Photo: EFM*

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The Ragland Triode Configuration Cell

Preprint of ICCF6 paper

TRIODE CELL EXPERIMENTS FOR CONTROLLED FLEISCHMANN/PONS EFFECT

Evan L. Ragland
the Boiler Works, Diamondhead, MS, 39525, USA

ABSTRACT

Experimental research and evaluation of three electrode (triode) cold fusion electrolysis cells is reported herein. Apparatus development began, after patent application, 05 June 1995. The triode apparatus introduces controlled loading and operation of Fleischmann/Pons-type (F/P) cells. In August 1995, excess heat generation was observed in initial triode apparatus experiments conducted by Dr. Dennis Cravens in his New Mexico laboratory. In November 1995 *the Boiler Works* laboratory in Diamondhead began experimental evaluation of the triode apparatus. A series of experiments in December, January, and February led to development of a functioning triode fusion reactor. The reactor was put into operation 20 March 1996 and operated continuously until 23 August 1996. Over the five months of operation of the reactor, several experiments were preformed and over 65,000 data points were recorded. This data base is being applied in further triode apparatus developments.

A second reactor test bed for "quick change" cathode specimen evaluation is in operation. Thin film cathode specimens prepared by the Materials Science and Engineering Laboratory of the University of Alabama in Birmingham are presently being evaluated. These include Pd film on Ag, Al, Cu, and quartz substrates and Pt films on Si bead specimens. Engineering design of a 2 KW reactor cell is underway.

Details of triode apparatus operation, control, and experimentai results are reported. The general design approach to the 2 KW reactor is described. It is concluded that sufficient experimental and theoretical understandings of cold fusion exist for engineering design and development of water heating appliances.

1. Introduction

The concept of the triode cell and the laboratory experiments reported herein are all guided by the Crowded Deuterium Model (CDM) construct presented by the author at ICCF3 in Nagoya, Japan in 1992. The reader should be informed that while CDM theory enjoys significant peer review and critique, that it is not a generally accepted concept nor is it rigorously proven in principle. Nevertheless, it has proved to be a useful tool for the visualization of F/P mechanics and for the design of devices and experiments. The CDM concept teaches that F/P is a bulk effect occurring within structural domains encompassed by at least one or more palladium hydride envelop(s); that often such domains occur naturally in polycrystalline palladium (Pd) saturated with nuclei of the hydrogens; that if hydrogen nuclei are sufficiently rich in deuterons; if the geometry of the structure is appropriate; and the random distribution of polycrystalline boundaries internal to the domain are propitious; that then deuterons may be crowded to nuclear fusion within the structure. Satisfying this set of particular conditions makes P/F experiments difficult to perform and extremely difficult to repeat. Furthermore, even when all other conditions are positive the last condition, favorable boundaries within the domain, is of such low probability that most domains reach internal Coulomb equilibrium and block before enough deuterons are absorbed to crowd to fusion. Finally, even with favorable boundary distributions, deuteron loading and sustainment of fusion may be erratic; i.e., sometimes rapid, sometimes sluggish, and sometimes blocked until equilibrium is internally or externally disturbed.

Fleischmann and Pons taught diode electrolysis of heavy water could be used to achieve low temperature nuclear fusion using a Pd cathode in a diode cell. Numerous experiments have since demonstrated generation of excess heat using various methods of electrolysis, gas discharge, and solid state with diode apparatuses. All methods encounter the conditional difficulties previously described. The diode characteristic of common anode/ cathode current affords limited possibilities for control. The triode apparatus—two anodes; one cathode —improves methods to load, ignite, sustain, and control the F/P effect. Most important; triode control overcomes blocking. Diode and triode apparatus characteristics are schematically illustrated in Fiq. 1.

2. Methods

Cell shadings in Figures 1 and 2 illuminate electrostatic gradients from positive, dark, to negative, light.

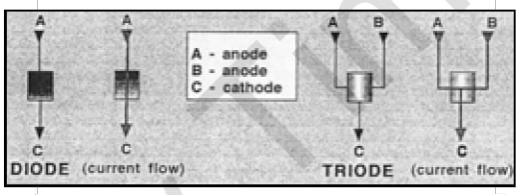
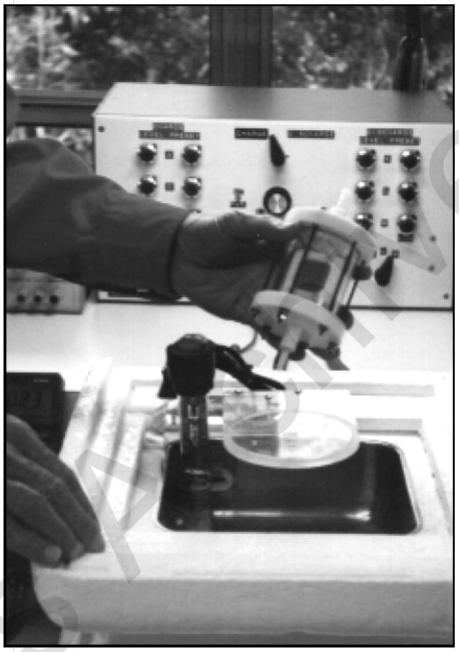


Figure 1. Diode vs. Triode electrical connections and electric current paths.

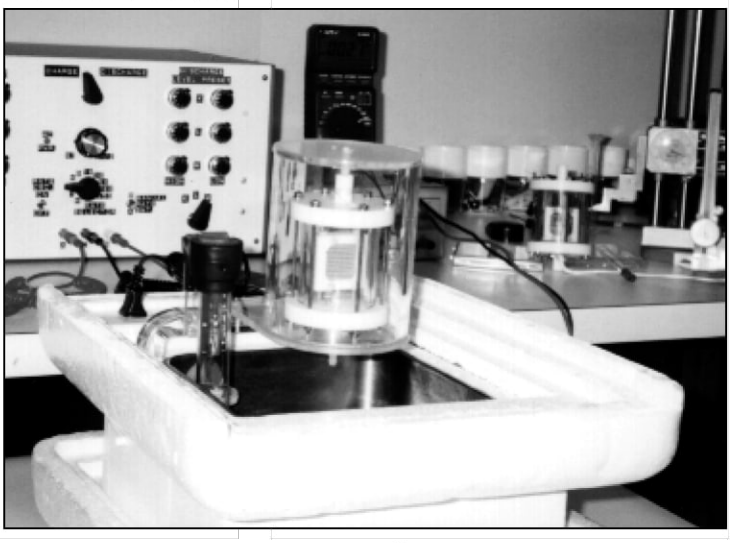
Diodes are limited to cathode current control whereas the triode can be modulated by varying the anode voltages A and B as well as by manipulation of the cathode current. This is particularly meaningful when one contemplates the relatively uniform current density characteristic of cathode surfaces in most electrolysis and gas discharge, and many solid state devices. In Figure 2, four examples schematically illustrate gradient control across a triode cathode cross section with independent anodes A and B at different operating potentials. Figures 2(a) and 2(d) illustrate the conventional method of cathode current modulation where anode voltages A and B are at the same potential. Figures 2(b) and 2(c) show how voltage potentials to anodes A and B may be alternated so as to cause the cross section gradient to sweep, or vary sinusoidally, exponentially, in step function, or in other manner. Switching and frequency rates can also be varied. These modulation methods enhance loading, ignition, sustenance, and control of F/P fusion cells by overcoming Coulomb equilibrium.



A simplified electrode configuration for a F/P triode cell is depicted in Figure 3 (a) and (b). *the Boiler Works* experimental cells are designed to mount cathode specimens 2.5 x 2.5 x 0.1 centimeters or smaller in a Teflon cathode frame. The cathode frame inserts between Teflon anode frames with eleven 0.051 centimeter diameter platinum wires. Other geometries are possible; the preferred embodiment is of different geometry.

Two laboratory test beds are in operation. The block diagram of Figure 4 identifies the functional elements and organization of the long term facility. These are two HP 361XA constant current power supplies, a function generator which programs the hp 361 XA current levels and the three (A, B, and C) output currents to the triode cell, and an environmental chamber. The "quick change" cathode test bed, is not described herein.

Long term testing utilizes flow through calorimetry in which gravity-fed clean water flows into the chamber, through the cell heat exchanger, and discharges into a sump. A pump returns water to the reservoir. The background diagram in Figure 5 shows this circulation system. The foreground of Figure 5 illustrates details of



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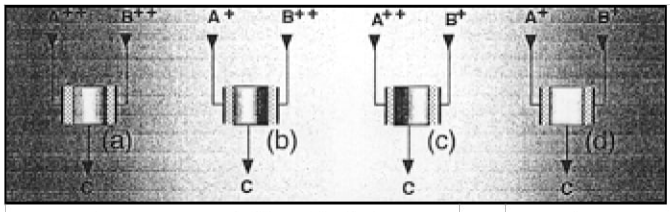

Figure 2. Current control [(a) and (d)]; Voltage control [(b) and (c)]

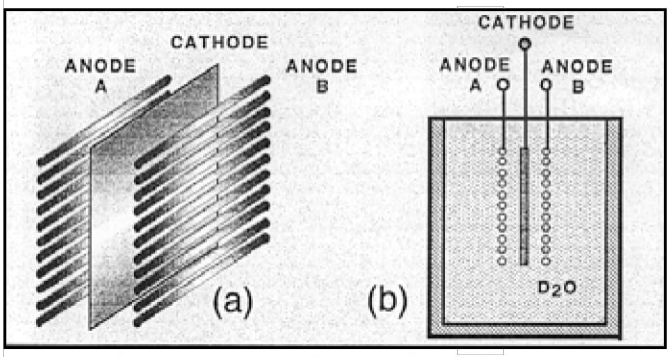

Figure 3. (a) Triode electrode configuration; (b) Triode cell cross section.

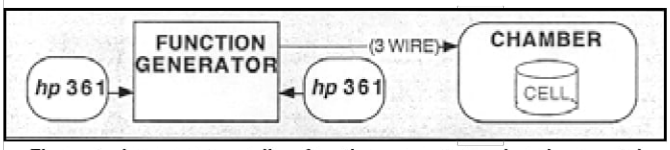

Figure 4. *hp* current supplies, function generator and environmental chamber.

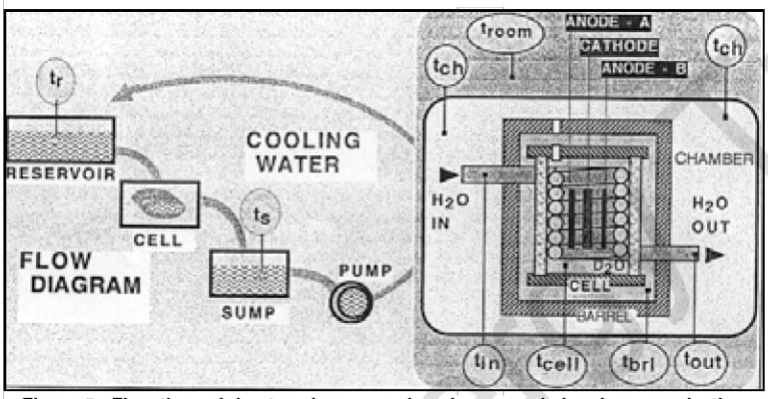

Figure 5. Flow through heat exchanger and environmental chamber organization

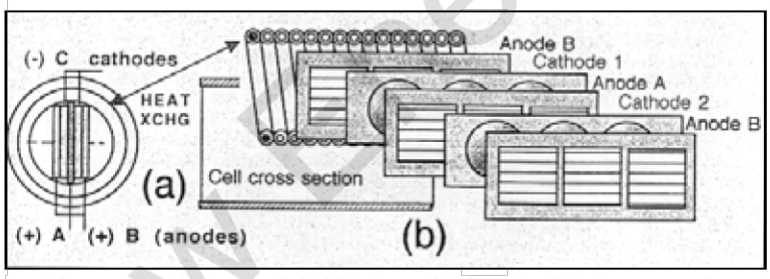

Figure 6. End (a) and exploded (b) views of 2kilowatt cell design approach.

the chamber, the cell, and temperature sensor locations. Cooling water flow rate is regulated by a valve and discharge is manually measured and recorded with each set (see Figure 5) of temperature data. The cell is thermally isolated within the chamber in a "barrel" enclosure. The chamber further isolates this enclosure from the laboratory environment. Chamber temperature is regulated and is stabilized by a two liter tank of ballast water. In the cell the triode structure is mounted inside the heat exchanger coil and both structures are completely immersed in heavy water. Gasses are vented through ports in the cell, the barrel, and the chamber enclosure. The electrolyte is 99.9% D_2O diluted with 0.1 mol of LiOH. Volume is 80 ml., replenished periodically when reaching a 70 ml. level.

3. Results

Patent application on the triode apparatus was filed 05 June 1995. A test cell was designed at *the Boiler Works* in June. Parts for two cells were fabricated in Houston, Texas in July. In late July the first F/P effect cell was assembled and calibrated by Dr. Dennis Cravens in his Cloudcroft, New Mexico laboratory. The first calibrated open cell test began loading on Thursday, 27 July. At 10:52 AM, MDT, Tuesday 01 August cell resistance began to drop and cell temperature began to rise. At 12:13 PM excess heat was measured at 40%; at 12:29 PM at 84%, and at 01 :1 8 PM after cell temperature was stabilized excess heat was calculated at 267%. On 02 August the cell was restarted. Maximum excess heat measured was 40%. Subsequent tests on 03 August produced null results. Bipolar triode and fibrous nickel cathode tests were also inconclusive.

In November *the Boiler Works* laboratory in Diamondhead began calibrated open cell experimental evaluation of triode apparatuses. These experiments were inconclusive. At 08:03 PM, 13 December temperature began to rise rapidly in a cell test begun on 10 December. By 12:02 AM, 14 December, with cell temperature at 200 degrees Fahrenheit, input power was switched to a minimal level. Efforts to repeat the anomaly went empty. The test was terminated on 15 December to clear the chamber for a test cell with a 5 micron Pd on silver (Ag) substrate cathode. This test, the first flow through calorimetry experiment, began on 23 December. The test was fraught with unexpected complications, miscalculations, and learning; however all new instrumentation worked precisely and excellent records were logged. The vexatious problem was absolute absence of any evidence of excess heat. This experiment terminated on 13 January. A second Pd on Ag cathode cell was calibrated on 07 February and put on test on 10 February. This experiment ended on 13 March, again without evidence of excess heat.

These experiments informed, albeit they evidenced no excess heat. In all tests versatility of triode control

Who is Evan Ragland—Inventor of the Ragland Triode Nuclear Reactor?

Born January 7, 1927 in Greenwood, Mississippi, Evan Ragland seems always to have had an affinity for high tech electronics and computers, with a special genius for solving problems. From early in his career, he became a pusher of the envelope of emerging technology to new heights with new benefits for people everywhere.

After Navy s service in World War II and after graduating from the U.S. Navy Electronics School, he earned a BS degree in electrical engineering at Mississippi State University in 1949. By 1952, he was in Chicago on the research staff of Magnecord, Inc., as a design engineer involved in the development of high frequency magnetic tape recording. Within two years he was with Victor Comptometer Corp., managing development of analog-to-digital conversion systems for airlines and the U.S. Air Force. Subsequently, Victor assigned Ragland to the task of developing the company's first digital computer.

In 1958, Ragland joined the research staff of Motorola, Inc., and over the next six years became chief engineer of the company's communications laboratories, responsible for all UHF, VHF, and avionic systems. He was also responsible for company systems to be used by the U.S. Navy in undersea warfare. In 1962, Ragland was elected to the advisory council to Motorola's board of directors.

Moving to New York in 1964 as general manager of information systems in the Division of the Singer Co., Ragland took charge of the pioneer development of retail point-of-sale transaction equipment. He succeeded brilliantly.

By 1968, Ragland had founded his own company, American Regitel Corporation in San Carlos, California, where he introduced and installed complete electronic point-of-sale systems for leadings department stores across the nation — thus adding to his sobriquet as "father of the U.S. point-of-sale industry." In 1976, Ragland sold his company to General Instrument Corporation, but stayed on as a vice-president and general manager of the retail division for another two years, following which he involved himself largely in research developments.

Today, Ragland serves as a consultant engineer, with his own laboratories in Diamondhead, Miss. During his long career, he has collected eight U.S. patents, most of them pioneering concepts in computers and electronics — ranging from the Daisy Wheel Printer developed for the U.S. Signal Corps whose original is now in Washington's Smithsonian Institution to the wipe-through reader of credit cards and digital-to-voice devices that form the basis for telephone answering machines.

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accelerated loading. A ranging investigation of F/P cathode characteristics through adjustments of triode voltages and switching rates provided experimental results to compare with theory. This review suggested the design of solid Pd cathodes be revisited. New Pd cathodes were designed. The first of these went on test at 08:28 PM, 20 March. At 02:03 AM, 21 March excess heat generation was observed. During the next week of operation cell output was 200% of input. Gain gradually increased to 500% with operation and better informed control. The reactor was in continuous operation until deliberately shut down 23 August 1996.

Evaluation of thin film cathodes is in progress in a reactor test bed dedicated to "quick change" cathode specimen testing. Thin film cathode specimens prepared by the Materials Science and Engineering Laboratory of the University of Alabama in Birmingham include Pd film on Ag, Al, Cu. and quartz substrates and Pt films on Si bead specimens. To date, these experiments have not exhibited generation of excess heat.

In June, engineering design of a prototype modular cell for application in water heating appliances was begun. The design goal is a 2 KW equivalent thermal output reactor cell for battery application in water heating systems. Market study, equipment specifications, cost analysis, and engineering layout were initiated in late July. Figure 6 illustrates the design approach which elaborates on the basic cell design of the March to August tests.

4. Discussion

Conceptually, triode apparatus mechanics avail means to overcome and control blocking during F/P cell loading and operation. Experimental success in improved loading and control tend to confirm the concept. Longevity, stability, and cell control demonstrated in the March through August experiment were particularly encouraging. Data gathered during this experiment create an extensive operational data base for advanced apparatus design. It is further encouraging that other laboratories plan to conduct triode experiments.

A second reactor test bed for "quick change" cathode specimen evaluation is in operation. Thin film cathode specimens prepared by the Materials Science and Engineering Laboratory of the University of Alabama in Birmingham are presently being evaluated. These include Pd film on Ag, Al, Cu. and quartz substrates and Pt films on Si bead specimens. Engineering design of a 2 KW reactor cell is underway.

5. Conclusion

Triode control accelerates loading, overcomes F/P cell blocking, and relieves experimental uncertainties heretofore attributed to cathode specimen incongruities. Triode experiments should lead to faster, more certain, and consistent results. Elimination of the "reproducibility" paradox should speed development and acceptance of F/P technology. Much remains to be done in development of cathode materials and fabrication techniques. Additionally, the state and behavior of condensed matter in the fusion locale is not well understood and must be further investigated. Nevertheless, sufficient experimental and theoretical understanding exists to begin engineering design and development of water heating appliances for practical uses.

5. Acknowledgments

The author wishes to thank Drs. Bruce Cain, Dennis Cravens, Michael Rigsbee, and Edmund Storms for their technical audience; Mrs. Theo Vaughey for her help in audit and review; and the many others for their encouragement, support, and counsel.

6. References

[1] Fleischmann, M., Pons, S., and Hawkins, M., "Electrochemically Induced Nuclear Fusion of Deuterium," *J. of Electroanal.. Chemistry*, 261, 301 (1989).

[2] Ragland, E., "Theory of Crowding Fusion," *Nuclear Physics Review*, Mississippi State University, May (1991).

[3] Bush, R., Cold Fusion Report, ICCF-2, Como, Italy, June (1991).

[4] Takahashi, A., "Nuclear Products by D_2O/Pd Electrolysis and Multibody Fusion," *Proc. Int. Symp. Non-linear Phenom. in Electromagnetic Fields*, ISEM, Nagoya, (1992).

[5] Ragland, E., Cain, B., and Gu, A., "Transport of the Hydrogens in Transition Metals," National Science Foundation, Washington, D.C., April, (1992).

[6] Tamaki, M. and Tasaka, K., "Field Formation of the Condensed Matter Fusion by Eiectro-Transport of Deuterium in Palladium," ICCF-3, Nagoya, Japan, October (1992).

[7] Ragland, E., "A Physical Description of Cold Fusion," ICCF-3, Nagoya, Japan, October (1992).

NEW KINDS OF ELECTROLYTIC REGIMES AND GEOMETRICAL CONFIGURATIONS TO OBTAIN ANOMALOUS RESULTS IN Pd(M)-D SYSTEMS

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1. **Abstract**

Electrolyses of long and thin Pd (and PdY alloy) wires, in dilute solutions of LiOD-D_20 and LiOH-H_20 at large operating voltages were made. An innovative kind of geometrical set-up to improve the efficiency of electromigration effect in proton conductors was developed: the usual "single-ended" geometry at the most cathodic point of the wire changed to the "central wire" geometry. The detected excess heat seems to be related to: (H/D isotopic effect, lattice characteristics, geometrical set-up, dynamic variation of concentration inside Pd wires anode-cathode and inter-cathodic voltages.

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[Editor's Note: Just a few extracts and figures from this seminal paper...]

Pulsing procedure

"...We further verified the effect of high power pulsing (peak current in the range as high as 20,000 - 200,000 A/cm^2; pulse width of 500ns; peak voltage between anode and cathode up to 300V) about rise time (80-300ns) and repetition rate (100-50000 Hz) with respect to loading and excess heat. In our experience, the excess heat detected by proper pulsing, given an experimental set-up and kind of Pd wire used, is about twice in respect to the most effective DC operation conditions that we can adopt."

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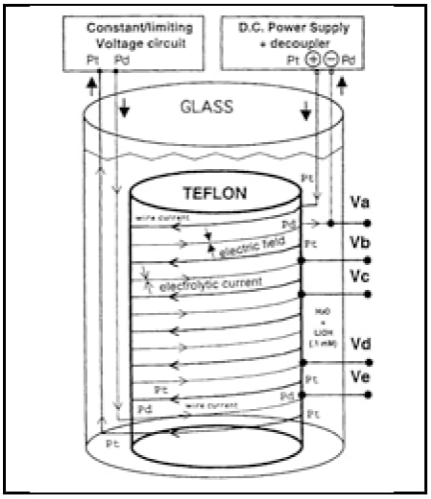
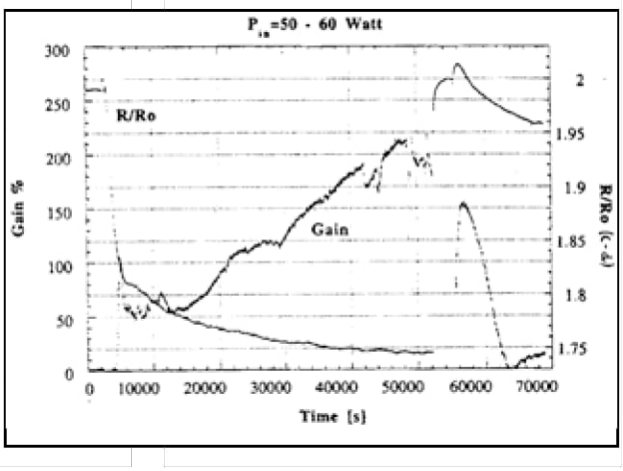
"The input power was about 50W and in this specific experiment, lasted about 20 hours, after the procedure of FLOATING (2 minutes) and subsequent restart (at the same electrical parameter, constant current), it was detected a very large amount (up to a maximum of 200 W) of excess heat. The amount of excess heat seems related to the speed of loading, as shown in fig.7 (time 4,000-6,000 seconds), and not to the absolute value of loading (time 48,000-52,000 seconds): although the R/R_o value (at time 50,000) is lower then at the beginning of the experiment, the excess heat begins to vanish because the speed of variation of loading is very low.

"In our opinion, this specific experimental result is quite significant to understand (and hopefully to control in the future) the phenomenology of Cold Fusion, at least from the point of view of excess heat generation."





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Transcript of Dr. Michael McKubre's Conference Summary Sixth International Conference on Cold Fusion

I must say I am rather pleased with the results of this conference. I see a number of very positive things. I think the fire that was fueled by the fever of enthusiasm from the beginning, that has sustained many of the people in this room, has resolved itself into a seriousness of purpose . . .

Partly, I think, because many people have accepted the positive answer to the physics question, "Îs there a phenomenon, or is there not a phenomenon?" I think it is perfectly clear that there are phenomena which we must explain. We must explain them first to ourselves and then we explain them to the world. With respect to nuclear products, Tullio [Bressani] gave a very good overview of the helium-4 results. Very impressive results. All the workers in that field are to be commended. If it turns out that the correlation between helium-4 and heat stands the test of time, Miles and Bush and Lagawski are going to deserve an awful lot of credit.

Tritium: two significant results were reported here. Or one sort of reported here. The report by Ed Storms of Tom Claytor's work was very, very impressive. Very interesting, and very hard to argue with. Clearly of nuclear origin. And Dr. Romodanov got to present a little snippet of his work. I am much more familiar with it. I have been to visit his experiment, seen it, and sampled the gas and analyzed the tritium in it. It is a very impressive piece of work that very closely conforms to the results that Claytor has obtained.

Transmutation products I think are the wild card in more ways than one. I just don't know how to assess the transmutation business. It is already spinning off mini-conferences of its own. Should that work hold up, it will certainly evolve to dominate future conferences.

Heat. On a rough count, I found more than twenty groups reporting heat, either in oral sessions or posters here. Different experiments, different experimentors, different techniques. The robustness of the heat observations seems to have achieved the point where we are not talking about *whether* there is a phonomenon, but *what* the phonomenon is. The issue of replicability, however, is severe. Neither the nuclear products nor the heat are attainable under sufficiently well defined conditions that we can guarantee to reproduce them on any given day, in any laboratory, for any period of time. That's a serious problem, both for the nuclear and the heat community, which are in fact obviously the same.

What I have suggested is that there are at least two, perhaps more, uncontrolled variables. I think this is a process with a transfer function. There is an input state. The input is a piece of palladium into which one is putting deuterons or other species. Temperature, composition, time – some of the variables we know about. We have identified some important variables. But the variables are clearly not enabling, as Ed Storms put it. There is also a process, a mechanism, after input, which gives you heat and the nuclear products. Some-where in this step are some hidden variables. And the theorists really have to help us understand what those variables are, so we might begin to find them, explore them, and control them.

Tullio already concentrated on nuclear products, and my field of expertise and interest pretty much is in electrochemical heat – the generation of excess heat, from electrochemical systems. This particular branch of the field has entertained most of the research interest, in my view. It is presumably the most significant in any commercial sense. I want to talk about what has occurred to me at this conference, and what has been referred to as the mass flow calorimetry problem. Here are the results reported by Mr. Kubota of the IMRA Japan effort. To my shame, I would say that the work done at IMRA Japan is probably the most systematic attempt to explore this generating function. They have done more systematic, more extensive effort in exploring the input variables than we have. Their results in 32 experiments: no excess power. The New Hydrogen Energy Lab's flow calorimetry system – an exquisite calorimeter, beautifully engineered – no results. At SRI we certainly have a paucity of results. I could certainly bring you any number of null results. All in good mass-flow calorimeters. Why is that? It is a worry to me. Remember the function:

Excess Power = Loading * Current * Flux

Excess power is some function of what I call "excess loading," D to Pd over some ratio; excess current, that gets you a large perturbation level; and flux. I should remind everybody that Professor Okamoto was kind enough to use this function. Others have described it. This is a very tenuous model, but let us suppose the model is right, and explore what might be happening in these various flow calorimetry systems. The first thing is, the data that Nakata, Kunimatsu and many other authors presented yesterday . . . their highest loading work (looking at the first factor in the function) is with palladium-rhodium. This function does not have anything to say about palladium-rhodium. I have absolutely no idea how it should behave, how it does behave, how it will behave. Clearly since hydrogen and deuterium load so easily into palladium-rhodium, the activity – which I believe is the important variable, an idea Martin Fleischmann has reinforced – the activity of hydrogen inside a palladium-rhodium lattice at the same value of X [loading] is much lower. So I don't know, I have nothing to say at all about the very high loading levels obtained by IMRA Japan in palladium-rhodium, and their failure in that system to observe excess power.

Martin Fleischmann(L), MIT's Peter Hagelstein, and Michael McKubre of SRI International at ICCF6. Carol White of *21st Century Science and Technology* .
Photo: EFM

One thing I did note, and I call to your attention, and this is not a criticism in any way, IMRA Japan have their own resistance ratio versus palladium loading functionality. Now their's might be right, and mine may be wrong. I have never claimed to have calibrated that function pretty well. But in order to convert resistance ratio to loading, we all have to use the same yardstick. The yardstick is already not straight. But, if we calibrate the yardstick differently we are going to find it very difficult to trade results. When they covert their resistance ratio to loading, they get different numbers than I would get converting resistance ratio to loading. So, please, either agree on a functionality with respect to loading, whether it be right or wrong, stick to one; or express results soley in terms of resistance ratio on the right hand side of the maxima, which I prefer to do. If you do that, you find that the loading levels that they have attained are not all that spectacular, certainly not as great as one would have guessed from the stated loadings given to us by Dr. Nakata.

[Getting back to the function], there is

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loading, there is current. The variable here at the end [Flux] is the wild card. Dr. Cilani made a very good point. You need to depart from the steady state. I believe this. With the mass flow calorimeter – the most sluggish and stable of animals – the hardest thing to do is to depart from the steady state. Very difficult to do. What we have done in part, partly in response to our critics [skeptics, not Fleischmann], is to make calorimeters in such a way as to improve the data quality. You improve the data quality by averaging things for a long time, never changing anything. So that when you present your data on a veiwgraph the lines are very clear with few irregularities you have to explain. In doing that, of course, you maintain the system as closely as possible in a steady state. We have engineered and designed our systems to do that. That is what flow calorimeters do well. I question, now, whether that is wise.

Another thing, which we had done in previous years is measure our resistance ratio by passing a rather large current, in a sequence of current pulses, through the cathode. So we were performing electromigration experiments, which was some sort of departure from the steady state. The take home message that I have had from this conference, that I will go back and act on immediately, is to reinvestigate – in our case it will be re-re-re-investigate – electromigration effects. We have started on this several times, found that it is very difficult to do, and given up. Electromigration – sometimes called the "Coehn effect" – passing a very large large current through the axis of your palladium wire, helps you in all of these things. It helps you in excess loading, it means you get a chemical potential increase, at least locally. Obviously it is current. Current plays a role, you are giving the system all the current it needs, and it imposes a flux. It also does what Martin and Stan Pons have exorted us to do: load it and then raise the temperature. You can pass enough current so that you actually increase the temperature. So for every reason I can think of, electromigration effects shuld be explored. I wish I had the courage of Giuliano Preparata. The experiment that he described was one that I would never have countenanced. I cannot imagine putting so much voltage into an electrochemical cell. My threshold of pain and fear is much too great. I am glad that he has done it and shown it is possible, and stable, and presumably safe. I might think about going back and doing it myself.

Thank you.

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Professor Bockris Makes Recommendations for Japan's Cold Fusion Effort

TO:
Prof. Hideo Ikegami
National Institute for Fusion Science
Nagoya, Japan

Dear Prof. Ikegami:

I write to you after hearing reports from the recent meeting in Hokkaido on cold fusion. I look back with great pleasure upon the four hour discussion we had in Nagoya in 1993.

My perception of the field of cold fusion at present is, briefly, this:

We should as soon as possible change all reference to fusion, although fusion may well take place in some of the mechanisms involved in reactions which we are looking at, it by no means explains all of them, it may explain a few of them. What is much better is to use the noncommittal word, "low temperature nuclear reactions," or "chemically assisted nuclear reactions."

These words are truth, such reactions occur— and as the mechanisms are to be established over the years by the usual scientific process.

The results of the recent meeting in Sapporo were mixed and although some of them were very good, the results from the IMRA laboratory in Sapporo were disappointing.

Many of us in the West have the image that this laboratory in Sapporo as the leading laboratory in this field — a well funded Japanese laboratory — and in so far as it does not give good results, it is a great disappointment to us and harms the field greatly.

Therefore, in this letter I want to tell you some things which I believe will help in furthering the work in Sapporo. I will send a copy of the letter to Dr. Kunimatsu, whom I know personally, and hope that this, too, will bring some changes in the mode of operation in Sapporo, although I believe that some outside person, hopefully yourself, might have to have some effect.

Whatever the actual mechanism of the reactions which occur in these phenomena, the techniques by which many of them are achieved are electrochemical. Further, the originator of this particular phase of nuclear reactions at low temperature (they were investigated long before Fleischmann and Pons), is a well known electrochemist, whose origins as a student I witnessed at Imperial College in 1946-49, and therefore, it is exceedingly important that the work be connected up with Electrochemistry and skilled electrochemists.

Now, very recently, I was visited by my former graduate student, Koheii Uosaki

Uosaki has taken the prestigious chair of Physical Chemistry at the University of Hokkaido which was previously held by Juro Horiuti, a man I knew well.

Horiuti was famous in Japan in the 1950's, and not as a physical chemist but as a rowing man! However, his world-wide reputation as an expert in catalysis, and a forerunner of many things that have happened in electrochemistry, is well known. Horiuti was, indeed, the second person to apply quantum mechanics to electrochemistry and has a most prestigious paper in 1936 which describes his comprehensive attempt to bring quantum mechanical reasoning into electrochemical theory.

Uosaki (who got his Ph.D with me in Australia in 1977), is the present holder of this chair and in the recent visit which he made to me in College Station, TX, he described the state of official government support of electrochemistry in Japan at this time. He is, in fact, he said, the principal organizer of the financial distributions of the considerable sums which the Japanese government is pumping into electrochemistry. In this situation he might be important to any cooperation which I am proposing.[1]

Anyway, the University of Hokkaido is the University in Japan which I know best. I was first invited to go there in 1961. Dr. M. Enyo, who is now the President of a University, worked with me in the late 1950's at the University of Pennsylvania in Philadelphia and got his Ph.D with me Prof. Hideaki Kita has just retired from the University of Hokkaido, Chemistry Department, and he worked with me for two years in Philadelphia.

Uosaki is an important player in this game. He has working with him about 19 people, of whom 10 or 15 are graduate students and post doctoral fellows.

Again, in the University of Hokkaido there are other people who are related to me. The principal one is Dr. Tadahiko Mizuno, who is in the Department of Quantum Chemistry in the engineering school. He has worked with Ohmori who is also an important player in that department.

This is the background, then, for me to say that I believe that it is irrational for work to go on in the NHE laboratory in Sapporo and not to be coupled with the work in electrochemistry at the University of Hokkaido. It would be best coupled with the work of Mizuno, who is fully enthusiastic and a world leader in the field, rather

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than Uosaki, although Uosaki has more people to give than Mizuno.

The people in the IMRA Laboratory should have three or four electrochemists from the University of Hokkaido who would tell them how to do electrochemistry.

The main things which have been missed out in Sapporo in the laboratory seem to me to be the following.

1. Lack of control of the potential of the working electrode.

It has been proven that the velocity of the production of nuclear material in the electrode depends exponentially upon its overpotential.

Overpotential is the difference between the actual potential of the electrode and the thermodynamically reversible or equilibrium potential which the reaction of this electrode possesses.

It is therefore important to measure and control the potential of the working electrode. It is of little consequence what is the potential of the whole cell. Thus, the whole cell is complicated because it includes the IR drop across the electrode and the potential at the anode, etc.

Measuring the potential of the cathode, however, is not simple and involves something called a Luggin capillary and may be an electronic apparatus for eliminating IR drop. This is important at the high current densities at which the effects are seen and there the IR drop can be enormous.

The most important piece of advice I can give is: control the electrode potential and measure it.

2. It is important to abandon the Fleischmann and Pons cylindrical electrodes. Those are the ones that we used until about 1991 or 1992. They have been abandoned by the rest of the field and only continued by Fleischmann and Pons. The phenomenon is a surface one and will work with thin films. Here, the details have to be researched but films should be of the order of 0.1-1m and it is important to control what the substance is. Let's start forgetting palladium! Palladium may have a part to play in palladium alloys and there are some indications flat palladium-nickel alloys are good, but at any rate alloys should be used and not the pure palladium. Above all, thin films.

3. The temperature. I do not know about this from my own experience, but others tell me that 80°C is an optimum temperature.

4. Glass and not teflon. Here again, I have used glass and not teflon. Certainly Mass increases the impurity level but Fleischmann says that glass is better than teflon and I accept anything which Fleischmann would say (he says all too little). The main thing is to understand something peculiar: some impurities may be good!

Everybody who works in the field knows this. The critical question and the great difficulty of the field is what impurities.[2]

So, here is the summary of what I want to say: above all, introduce an electrochemist in the scheme in the laboratory of IMRA at Sapporo and any other Japanese laboratory, if you have the influence.

The supply of physical electrochemists in Japan is mainly at the University of Hokkaido, although there is also a good electrochemical supply, from I. Taniguchi, who also worked with me in the mid-1980's, and who is at a University in Kushu.

The second thing is to apply conditions to the experiment which have been established by others.

One last thing, a matter of common sense but it doesn't seem to be realized, and that is to stop going on with experiments that don't succeed. I learned from reports that I got from Tom Passel [EPRI], that IMRA did 28 experiments with zero results. That is absurd. After six or seven experiments of course the method should bc changed.

Well, - anyway, - I do not know what influence you have at the moment. I am told that you have formed a company. Good luck. I plan to do the same when I retire in June, 1997.

All the best,

J.O'M. Bockris
Distinguished Professor of Chemistry
Texas A&M University

[1]Unfortunately, Uosaki is not well disposed towards cold fusion. He is, so to speak, blank about it, and claims that the death of Mr. Toyoda some years ago has undermined the support in Japan.

[2]I have written a paper recently about the conditions for obtaining good results and this will be published in the Journal of New Energy in the next few months. I will send you a copy of it when it comes out. I have got a much more detailed scheme there and it depends upon some ideas I have which are quite speculative. In this letter I remain with the things which have been established.

ICCF7
Vancouver, Canada
April 19-24, 1998

CALENDAR

ICCF5 – Fifth International Conference on Cold Fusion
April 9-13, 1995
Monte Carlo, Monaco

Low-energy Transmutation Meeting (Private) At Texas A&M University
June 19, 1995

The 2nd World Hydrogen Summit
September 28
-October 1, 1995
Montreal, Quebec, Canada

16th Symposium on Fusion Engineering (SOFE '95), *with cold fusion component!*
October 1-5, 1995
Champaign, Illinois

Third Russian Conference on Cold Fusion and Nuclear Transmutation
October 1—8, 1995
Sochi, Russia

Power-Gen '95
(CETI cell demo)
Anaheim, California
December 5-7, 1995

New Ideas in Natural Sciences
June 17-22
St. Petersburg, Russia

1996 International World Energy System Conference
June 19-21, 1996
Toronto, Canada

2nd Low-Energy Transmutation Meeting
College Station, Texas
Sept.13-14, 1996

ICCF6—Sixth International Conference on Cold Fusion
October 13-18, 1996
Hokkaido, Japan

Building Energy—Insuring a SustainableFuture
March 12-15, 1996
(Sponsor: Northeast Sustainable EnergyAssociation)
Radisson Hotel and Conf. Center
Cromwell, Connecticut

ICCF7—Seventh International Conference on Cold Fusion
April 19-24, 1998
Vancouver, CANADA

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Critique of the NHE Experiments
An Open Letter to the NHE Lab Directorate

by Jed Rothwell

Over the last three years I have felt a growing sense of unease about the NHE cold fusion program. I would like to describe my impressions at ICCF6, during the tour of the NHE lab, and in conversations with Pons, Fleischmann, Kennel, Asami and others. I feel that the program has great promise, but in execution it is deeply flawed. Let me state my opinion bluntly, and make recommendations that I hope will be of some assistance to the NHE program.

Based on what I have seen, in my opinion, the equipment at the NHE lab is splendid, the attitude of the researchers is laudable, but a number of mistakes are being made. I fear that you are making fundamental errors in experimental technique. Let me note here that Fleischmann agreed with me. Your researchers are not paying attention to techniques described in papers by Ikegami, Storms, Fleischmann, Celani and other leading researchers. After hearing the presentations at ICCF6, meeting directly with the NHE researchers and discussing this work, my impression is that they are not paying sufficient attention to the literature. In the *Japanese Journal of Applied Physics*, Ikegami [1] spelled out four essential conditions to achieving the cold fusion effect:

1. *Sufficiently high current density*
2. *A deuterium loading ratio (D/Pd) over 0.85*
3. *Proper surface preparation*
4. *A cathode temperature over 80 C*

Celani adds a fifth essential: non-equilibrium triggering conditions, like a sudden change in temperature. (Storms disagrees, but most other experts say a trigger is needed.) Storms [2] and Cravens [3] describe essential characteristics of the palladium; methods of testing palladium before the experimental run to determine whether the palladium will work or not; and methods of improving the palladium quality. I believe you have met the first two conditions listed by Ikegami, but you have not considered the others.

As McKubre aptly pointed out in his closing remarks, an SRI-style flow calorimeter is designed to ensure maximum equilibrium, unchanging temperatures, and a cool cathode. I have been saying for a long time that flow calorimeters prevent the CF effect from occurring. The design is simply not suitable for these experiments. Many other researchers have pointed out these design faults. I do not understand why it has taken McKubre so many years to realize what has been said all along. At ICCF3, ICCF4 and ICCF5 Fleischmann [4, 5, 6] described the essential role of high temperatures in promoting the reaction, in what he calls "'positive feedback' between the temperature and the rate of excess enthalpy generation." At ICCF4, Storms [7] characterized the role of temperature, and McKubre [8] described one of the most dramatic heat bursts in the SRI flow calorimeter, which occurred in 1993 when the flow was accidentally blocked and the cathode temperature rose higher than planned. McKubre pointed out that this confirmed Fleischmann's hypothesis. Why has the NHE paid so little attention to these vital lessons about temperature, repeated year after year by leading scientists? In addition to the fundamental errors described in the literature, experts have made specific criticisms of the materials and techniques. For example, at ICCF6 Fleischmann told me that glassware is much better than Teflon for these long duration experiments.

I fear that if you continue this way, your funding will be cut off in a few years. Frankly, if I were in charge of the budget, I would cut your funding today, and I would allocate the money to other groups that have achieved significant results, in more creative research. I believe you face a crisis, and in such times I believe it is best to follow the advice of the Duke of Albany in the closing lines of King Lear:

> **The weight of this sad time we must obey,**
> **Speak what we feel, not what we ought to say.**

Not only have you ignored the literature, but you have concentrated exclusively on bulk palladium with heavy water, ignoring the easier, better alternatives. You have limited yourselves to the most difficult and unpromising materials and techniques. Instead of using the materials that nearly always work, like thin-film nickel or gold, or materials that often work, like high-temperature proton conductors, you persist in trying to use bulk palladium at low temperatures, which only worked at SRI years ago, in experiments that even SRI now cannot replicate. It seems the NHE program was set in stone years ago. You have ignored progress, and you have ignored the setbacks reported by SRI. I think that scientific research requires more flexibility. You cannot set a precisely defined course of action three years ahead of time and then stick to it without alteration and without paying attention to developments in other labs.

When researchers repeat a difficult experiment many times over a period of months with no success because there is no alternative, that is laudable, dogged persistence. That kind of heroic dedication is essential to scientific progress. But when they repeat that same experiment for years without success, ignoring better techniques and disregarding papers by leading scientists describing their mistakes, that is misguided. It shows an unwillingness to learn from experience, and from other scientists. It is a tragic waste of talent. The NHE lab is considered the flagship of cold fusion. It has the best equipment and some of the finest, most dedicated and skillful workers. You have the opportunity to make scientific history.

I urge you to open your eyes to some of the well-established, replicated alternatives before it is too late. You should start with a 20-minute taxi trip over to the University of Hokkaido. The experiments being performed there by Mizuno, Ohmori, Enyo et al. are the best in Japan, and among the best in the world. They get consistent results at high signal-to-noise ratios. They observe dramatic, massive transmutations that produce unnatural isotopic ratios and other indisputable proof of nuclear reactions. This proof is more convincing than the mainstream neutrons, x-rays or tritium results, because the effects are large and easy to detect, non-transient, and cumulative. The longer the reaction runs, the more metal is transmuted. Mizuno's proton conductors [9] have been confirmed by Oriani, [10] who is one of the best electrochemists in the world. Enyo and Mizuno's palladium transmutation results have been confirmed by Minevski & Bockris [11]. Ohmori's [12] gold results have been confirmed by Swartz [13]. Ohmori has repeated his experiment more than 50 times, demonstrating massive excess heat and transmutations in every run. He inputs 5 watts. After a 3 to 5-day incubation period, he observes between 0.4 and 1.0 watts output, producing a 4 C Delta T temperature in his isoperibolic calorimeter. The reaction generates transmuted material at levels 100 times higher

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than contamination from all sources in the cell, including material with highly unnatural isotopic distribution.

I think it is best to replicate experiments done by people close by, who can assist you on a day to day basis. But you might also consider testing CETI-style beads fabricated by the University of Illinois, if that can be arranged. Miley [14] reported that up to 40% of the nickel in these beads is transmuted into other metals. You should not attempt to fabricate the beads yourself until you have gained experience using them and you are sure they work with your equipment. You will experience significant problems with things like conductivity and cleanliness, so you should start with beads you know will work when everything else is right.

It may be difficult for you to admit it, but you should realize that the Hokkaido University researchers run rings around you. You have much to learn from them. They have been doing cold fusion since 1989. They know more about electrochemistry than you do. They have degrees in electrochemistry and they have been working on similar experiments for decades, whereas I have heard that you do not have any full-time Ph.D. electrochemists in the NHE lab. You appear to be modeling your work on SRI's program [*Editor's Note: SRI, however, has world class electrochemists.—EFM*], yet Hokkaido University's results are far superior to anything SRI has ever achieved. I cannot understand why you ignore such splendid work in your own back yard while you attempt to do obsolete experiments performed years ago by SRI. I do not think that you or anyone else can suggest a valid reason to doubt the Hokkaido University results. Their calorimeters are not as sophisticated as those of SRI, but they are simpler and more reliable.

Again I urge you to spend some time in the labs at Hokkaido University observing the experiments and learning the techniques from people who have spent their careers doing electrochemistry. You cannot master a highly technical skill by any other means. I have never heard of anyone gaining a Ph.D. level of understanding of electrochemistry by reading textbooks and scientific papers alone.

I urge you to get a fully made-up, prepared cell from Ohmori, bring it back to your lab, and test it with your own instruments. Please do not attempt to make one yourself at first. I discussed this work with Ohmori and Mizuno while I was translating their papers into English. The experiment is much harder than it looks. A step-by-step learning process is essential. You must take advantage of every opportunity to make the job easier and to improve the likelihood of success.

You have seen a clear example of what can go wrong in your own lab with the Pons and Fleischmann boil-off experiment. Even with some direct, hands-on help from Stan Pons, you were not able to replicate this in 20 attempts. Yet both SRI [15] and the French Atomic Energy Commission (CEREM) [16] were able to replicate this experiment. Why did they succeed where you failed? I believe the main reasons are:

1. McKubre is an experienced electrochemist;

2. Lonchampt et al. worked on this experiment for four years, according to Pons [17];

3. Lonchampt insisted on doing a rigorous, precise, engineering-style replication, down to the last wire. He works the way an engineer would set up a semiconductor production line: he does everything exactly according to the book, making no attempt to be "creative" or to change anything. He thinks that you must master the subject first, then add your own contribution to the field.

During the tour of the NHE lab, I saw some apparent differences between your boil-off cell and Pons and Fleischmann's, starting with the fact that theirs was half-silvered. I have no idea which differences in the hardware or protocol caused your cell to fail. However, the experiment has now been independently replicated by two different groups, so I believe you must be making a mistake. If you had gotten more help, and if you had replicated the experiment with exactly the same glassware and wires, or better yet, if you had practiced with a cell and cathode that had worked repeatedly in France, then your boil-off experiment would have worked as well as CEREM's did. You could have built on that lesson. You might go back and do so now, but I recommend you start with an easier, more reliable experiment like Ohmori's.

Footnotes

1. H. Ikegami, "The Next Steps in Cold Fusion," *Oyou Butsuri*, Vol 62, No. 7, July 1993, p. 717.

2. E. Storms, "How to Produce the Pons-Fleischmann Effect," *Fusion Technology*, March 1996.

3. D. Cravens, "Factors Affecting the Success Rate of Heat Generation in CF Cells," *Proc. 4th Int. Conf. on Cold Fusion*, Lahaina, Maui, EPRI TR-104188, Vol. 2, 18-. Voted Best Paper in Conference by Fleischmann.

4. M. Fleischmann, "Calorimetry of the Pd-D_2O System: from Symplicity via Complications to Simplicity," *Frontiers of Cold Fusion; Proc. 3rd Int. Conf. Cold Fusion*, Nagoya, 1992, ed. H. Ikegami (Universal Academy Press, Tokyo, 1993), p. 47.

5. M. Fleischmann, "Calorimetry in the Pd-D_2O System: The Search for Simplicity and Accuracy," *Proc. 4th Int. Conf. on Cold Fusion*, Lahaina, Maui, EPRI TR-104188, Vol. 1, p. 1-13.

6. M. Fleischmann, "More about Positive Feedback; more about Boiling," *Proc. 5th Intern. Conf. on Cold Fusion*, Valbonne, France, IMRA Europe, p. 140.

7. E. Storms, "Some Characteristics of Heat Production Using The 'Cold Fusion' Effect," *Proc. 4th Int. Conf. on Cold Fusion*, Lahaina, Maui, EPRI TR-104188, Vol. 2, p.4-1.

8. M. McKubre, "Loading, Calorimetric and Nuclear Investigation of the D/Pd System," *Proc. 4th Int. Conf. on Cold Fusion*, Lahaina, Maui, EPRI TR-104188, Vol. 1, p.5-52.

9. T. Mizuno, "Formation of 197Pt Radioisotopes In Solid State Electrolyte Treated by High Temperature Electrolysis in D_2 Gas," *Infinite Energy*, #4

10. R. Oriani, "A Confirmation of Anomalous Thermal Power Generation From A Proton-Conducting Oxide," *Proc. 6th Int. Conf. on Cold Fusion*, Hokkaido, Japan, O-036. To be published in *Fusion Technology*, 1996.

11. Z. Minevski, "Two Zones of 'Impurities' Observed After Prolonged Electrolysis of Deuterium on Palladium," *Infinite Energy*, combined Issues 5 and 6, p. 67.

12. T. Ohmori, "Isotopic Distributions of Heavy Metal Elements Produced During the Light Water Electrolysis on Au Electrode," *Proc. 2nd Int. Low Energy Nuclear Reactions Conf.*, College Station, Texas, and *Proc. 6th Int. Conf. on Cold Fusion*, Hokkaido, Japan, TS-004.

13. M. Swartz, "Possible Deuterium Production and Light Water Excess Enthalpy Experiments Using Nickel Cathodes," *Proc. 2nd Int. Low Energy Nuclear Reactions Conf.*, College Station, Texas. (Available from the Fusion Information Center, Salt Lake City.)

14. G. Miley, "Nuclear Transmutations in Thin-Film Nickel Coatings Undergoing Electrolysis," *Infinite Energy*, #8, p. 19

15. S. Crouch-Baker, "Mass Flow Calorimetric Studies under Non-Steady State Conditions," *Proc. 6th Int. Conf. on Cold Fusion*, Hokkaido, Japan, P-004

16. G. Lonchampt, "Reproduction of Fleischmann and Pons Experiments," *Proc. 6th Int. Conf. on Cold Fusion*, Hokkaido, Japan, O-044

17. S. Pons, Private communication (October 1996)

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Japanese Translation of Jed Rothwell's Open Letter to the NHE (Translation by Jed Rothwell)

NHE研究に対する公開批評

Jed Rothwell

過去三年間にわたって、すでにNHE 常温核融合プロジェクトが進行していますが、その計画について、私は少なからず不安を感じていました。というのは、NHEのプログラムは前途有望のようですが、現実にはうまくいってないのではないかということです。今回、ICCF6 で NHE 研究所を訪問し、Fleischmann、Kennel、浅見氏らと話す機会を得ましたので、その際に感じたことを述べたいと思います。ここで率直に私の意見を述べることによって、それがいくばくかでも NHE の研究の助力になればと願います。

私の拝見したところ、NHE 研究所の設備はすばらしく、研究者たちも優秀で、大変積極的でした。しかし、実験そのものに、いくつかの問題があり、特にその進め方に、基本的な間違いがあるのではないかと不安を感じたことです。これに関しては、Fleischmann も私と同意見であったことを付け加えたいと思います。まず初めに、 NHE の研究者は、池上、Storms、Fleischmann、Celani や他の先進的な研究者の論文に記述された技術的な報告をあまり見ていないのではないかということです。それに関しましては、ICCF6 での発表の後、私はそこの研究者たちに直接お会いして、実験についてお話しをうかがいましたが、文献をあまり重視してはいないように感じました。池上は応用物理学会誌(1)で過剰熱発生には四つの条件が再現性のために必要だと述べています。すなわち、1.パラジウム陰極表面で電解の電流密度を十分高くし、2.重水素吸蔵率(D/Pd)は 0.85 以上、3.適当なパラジウム電極の表面修飾、4.パラジウムの温度は摂氏 80 度以上にするということ等です。さらに Celani は 5 番目の条件を加えています。それは均衡を破る誘因、たとえば温度の変化が必要だということです。（ただし、Storms はこの誘因の条件には同意していませんが、他の多くの専門家は誘因が必要だと述べています。）Storms(2) と Cravens(3) はどのような特性を持つパラジウムを使用すれば良いか、電解実験前にその特性を持つか否かを見分ける方法、さらにはパラジウムの状態を改善する方法を述べています。NHE は池上の最初の 1.と 2. の条件は取り入れていますが、他はほとんど考慮されていません。

第２にこれは Mckubre が ICCF6 の閉会の言葉の中でいみじくも指摘していましたが、SRI 式の流動式熱量計は、平衡状態を保つために一定温度とし、電極を逆に冷却するように設計されています。このことは私が以前から指摘していたことなのですが、もし CF 効果が起こる実験装置を設計するならば、SRI 方式は適当ではないと考えます。その他の多くの研究者たちも SRI 式のデザインの不適切をいっているのに、なぜ著名な SRI の Mckubre がそのようなことに長い間気が付かなかったのか理解できません。これに加えて、ICCF3、ICCF4 さらにICCF5 で Fleischmann(4.5.6)は高温であることが反応を起こす重要な誘因となっていることを指摘しました。この現象をつぎのように名付けています、" Positive feedback between the temperature and the rate of enthalpy generation（発熱量と温度との正のフイードバック関係）" ICCF4 で Storms(7)が温度と過剰熱との関係の明確なデータを発表しました。SRI の Mckubre(8)は 1993 年に起こった劇的な、急激な熱発生を説明しました。これは装置の故障によって冷却水の流れが止められ、その結果、装置の温度が設定されていた以上にあがり、急激な過剰熱が発生したのです。(Fleishmann がいったとおり、高温が反応を引き起こしたことが、実際にあったわけです。）Mckubre はこれが Fleishmann の仮説の裏付けになると指摘していました。NHE はなぜこのような優れた研究者が何年も繰り返し述べている温度の効果を考慮しないのでしょうか。

文献を重視していないということで起こった、他の基本的な間違いは、専門家が材料と技術的な内容について批評を行っているのに気が付いていないのではないかということです。たとえば ICCF6 で Fleishmann が私に話したのですが、ガラスセルはテフロンセルより、長期間の実験には格段に優れているということです。NHE が今のままの研究方針であれば、数年内に研究費は打ち切られるのではないかと懸念します。正直にいって、もし私がこの研究の総括責任者であれば、直ちに研究費の配分を考え直します。そして他の独創的な結果を出しているグループの研究費を増やすことをするでしょう。NHE は重大な転機に直面していると感じます。このようなときに、私ならば、「リヤ王」の終章のアルバニ卿の台詞の教えに従うでしょう。

(「The weight of this sad time we must obey, speak what we feel, not what we ought to say.」「この悲しい時代の重荷に耐えていくほかあるまい。感ずるままを語り合おう。儀礼の言葉は口に出すまい。」)

NHE は文献を重視しないだけではなく、もっとやりやすくて、より良い方法を採用せず、一途に、重水中で一つのパラジウムの固まりを使う方法だけにこだわっています。将来的に見込みのない、難しい材料と技術しか試していません。これでは失敗するのが目に見えています。ニッケルや金の薄いフイルムのように、ほとんどの場合に反応を起こす有力な材料、あるいは高温のプロトン導電性のセラミックスのように、かなりの頻度で反応を起こす材料を使う代わりに NHE は低温で、かつまた、パラジウムの固まりのみを使う方法を繰り返してきました。そのやり方は何年か前に先駆者のSRIでのみ成功した方法ですが、今ではSRIでも再現できていません。NHEは何年か前に自分の研究方針をしっかりと決めてしまい、他の研究所での進行状況に目を向けず、また SRI でさえも再現できないと言う報告も省みてはいません。科学研究には柔軟性が必要だと思います。三年先までの計画をがっちりと決定してしまい、選択の余地なく、また他の研究者の進み具合にも注意をはらわないと言うことは私にはまったく理解できません。

References:

1. H. Ikegami, "The Next Steps in Cold Fusion," Oyou Butsuri, Vol.62, No.7,July 1993, p. 717, in Japanese.

2. E. Storms, "How to Produce the Pons-Fleischmann Effect," *Fusion Technology*, March 1996.

3. D. Cravens, "Factors Affecting the Success Rate of Heat Generation in CF Cells," *Proc. 4th Int. Conf. on Cold Fusion*, Lahaina, Maui, EPRI TR 104188, Vol. 2, 18 1 (Voted Best Paper in Conference by Fleischmann).

4. M. Fleischmann, "Calorimetry of the Pd /$D_2$0 System: From Simplicity via Complications to Simplicity," *Frontiers of Cold Fusion: Proc. 3rd Int. Conf. Cold Fusion*, Nagoya, 1992, ed. H.Ikegami (Universal Academy Press, Tokyo, 1993), p. 47.

5. M. Fleischmann, "Calorimetry in the Pd-$D_2$0 System: The Search for Simplicity and Accuracy," *Proc. 4th Int. Conf. on Cold Fusion*, Lahaina, Maui, EPRI TR 104188, Vol. 1, p. 113.

6. M. Fleischmann, "More about Positive Feedback; more about Boiling," *Proc. 5th Intern. Conf. on Cold Fusion*, Valbonne, France, IMRA Europe, p. 140

7. E. Storms, "Some Characteristics of Heat Production Using The Cold Fusion' Effect," *Proc. 4th Int. Conf. on Cold Fusion*, Lahaina, Maui; EPRI TR-104188, Vol. 2, p. 41.

8. M. McKubre, "Loading, Calorimetric and Nuclear Investigation of the D/Pd System," Proc. 4th Int. Conf. on Cold Fusion, Lahaina, Maui, EPRI TR 104188, Vol. 1, p. 5-52.

9. T. Mizuno, "Formation of ^{197}Pt Radioisotopes in Solid State Electrolyte Treated by High Temperature Electrolysis in D_2 Gas," *Infinite Energy*, Vol.I, No.4, 1995, p.9-11.

10. R. Oriani, "A Confirmation of Anomalous Thermal Power Generation From A Proton Conducting Oxide," *Proc. 6th Int. Conf.on Cold Fusion*, Hokkaido, Japan, O-036. *Fusion Technology*, Vol.30, No.2, 1996 p.281-287.

11. Z. Minevski, "Two Zones of 'Impurities' Observed After Prolonged Electrolysis of Deuterium on Palladium," *Infinite Energy*, Combined Issues 5 &6, p. 67.

12. T. Ohmori, "Isotopic Distributions of Heavy Metal Elements Produced During the Light Water Electrolysis on Au Electrode," *Proc. 2nd Int. Low Energy Nuclear Reactions Conf.*, College Station, Texas, and *Proc. 6th Int. Conf. on Cold Fusion*, Hokkaido, Japan, TS 004.

13. M. Swartz, "Possible Deuterium Production and Light Water Excess Enthalpy Experiments Using Nickel Cathodes," *Proc. 2nd Int. Low Energy Nuclear Reactions Conf.*, College Station, Texas.

14. G. Miley, "Nuclear Transmutations in Thin-Film Nickel Coatings Undergoing Electrolysis," *Infinite Energy*, #8, p. 19.

15. S. Crouch Baker, "Mass Flow Calorimetric Studies under Non Steady State Conditions," *Proc. 6th Int. Conf. on Cold Fusion*, Hokkaido, Japan, P 004.

16. G. Lonchampt, "Reproduction of Fleischmann and Pons Experiments," *Proc. 6th Int. Conf. on Cold Fusion*, Hokkaido, Japan, O-044

17. S. Pons, Private communication (October 1996).

Editorial—Continued from 3

very shortly on the new energy demo market. He even suggests that he can make a scaled-up 2-kilowatt reactor in the near term. Francesco Celani and his group in Italy has pioneered electromigration effects, which show fantastic promise for high-power generation by simple means.

Of course, all of this is simply too outrageous to be happening, right? No, it's outrageous-squared and it *is* happening!

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研究者が、他の選択肢がないため、何ヶ月もの間、成功の見込みのない、困難な実験を繰り返しているということは大変な努力と忍耐を要します。このような英雄的ともいうべき、献身と、勤勉なしでは科学の進歩はあり得ません。しかし、あえて申し上げますが、もっと良い方法を試そうとせず、かつ、他の研究者の失敗の教訓を無視して、うまくいく見込みのない実験を何年も続けることは無駄ではないでしょうか。これは経験から学ぼうとする心がないと言うことではないでしょうか。研究者のせっかくの才能の無駄使いだと思います。NHE研究所は常温核融合のリーダーだと考えて良いでしょう。ここには世界でも最高の実験装置と極めて優秀な科学者がそろっています。科学の歴史に残るような機会を与えられているのです。

手遅れにならないうちに、しっかりした再現性の高い他のやり方にも目を向けられるようにおすすめいたします。まず初めは車でたった 20 分の所にある、すぐそばの北海道大学の訪問から始めるべきです。水野、大森、延与の実験は日本国内、かつ世界の中でも、最も優れている実験の一つです。常に確度（s/n比率）の高い結果を発表しています。実験の結果として、劇的な比率の元素生成を観測しています。比率が不自然な同位体元素が得られということは、議論の余地のない明白な核反応の証拠です。この証拠は従来の研究の主流となっている中性子、X 線、トリチウムの結果より説得力があります。なぜなら、この効果は規模が大きく、検出しやすく、瞬間的なものでではなく、累積証拠だからです。実験を続ければ続けるほど、元素変成の比率が増えます。水野(9)のセラミックスは電気化学の世界的権威である Oriani(10)によって確認されています。延與と水野のパラジウムの元素変成実験はMinevski & Bockris(11)によって確認されました。また大森(12)の実験による金の元素変成は Swartz(13)によって確認されました。大森は実験を 50 回以上も繰り返し再現し、毎回、大量の過剰熱と元素変成を証明しました。その実験では 5w の電解入力で、その後 3～5 日経過すると 0.4w～1.0w の過剰熱が出はじめます。測定中の温度は摂氏で約 4 度上昇し、その反応によってセル内にある不純物の総量の 100 倍もの元素変成物を得ました。それは不自然な同位体元素生成物を含んでいます。

身近にいる研究者の実験の再現をする方が良いと思います。なんといっても日々の手助けが得られます。しかし、またイリノイ大学と打ち合わせが可能であれば、そちらで製造された CETI 式電極を試すことも良いでしょう。Miley(14)は CETI 電極のニッケルの 40% が他の元素に変わったと報告しています。自分たちで製造するよりも、まずはできたものを入手して、NHEの実験装置でうまくいくかどうか、試した方が良いでしょう。電極は玉（ビーズ）からできているので、実験ではビーズ玉同士の接触の問題があります。清浄を保つのも容易なことではありません。ですが、他の条件が整っていますので、ビーズ玉の実験を始める方が良いでしょう。

素直に認めるのは難しいでしょうが、NHEより北海道大学の研究者たちの方が、より明らかな報告をしています。彼らから学ぶことはたくさんあると思います。

北海道大学では1989年から常温核融合研究に取り組んでいます。研究者は NHE より電気化学に通じています。NHEでは電気化学で博士号を得た人はいないとうかがいましたが、北海道大学ではもう何十年もこの分野の研究を集中的に行っています。研究者は電気化学で博士号を得た人たちです。NHE は SRI を手本にして実験をやっているようですが、北大は SRI より明確な結果を得ています。SRI で何年か前に行われた、今はもうすたれてしまった実験をやるより、NHE の裏庭とでもいうべき場所で行われている結果をなぜ無視するのか理解に苦しみます。北大の結果に対しては、だれも誤りを指摘していません。そこの熱量計は SRI ほど洗練されてはいませんが、シンプルで信頼できる装置です。

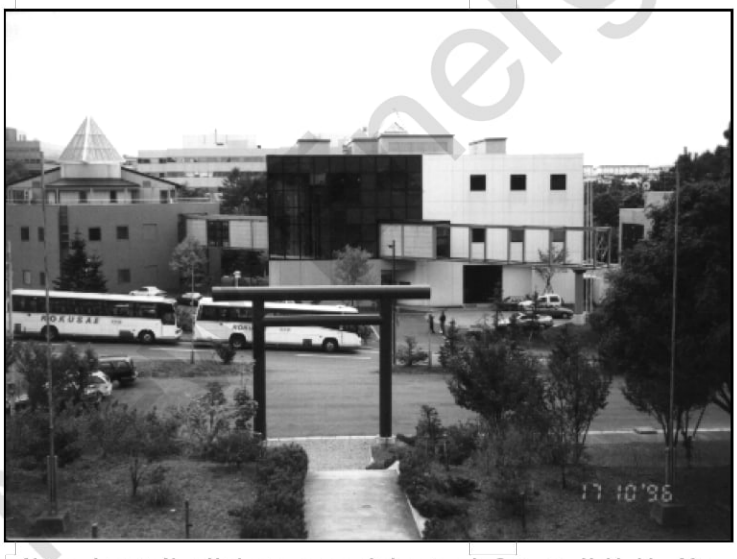
再び申し上げますが、北大の研究室に行かれて、電気化学の研究者たちから技術的なことについて討論することをおすすめします。教科書や文献だけを頼りにして博士のレベルの電気化学が修得できるとは寡聞にして聞いたことがありません。大森からすでに用意のできたセルを NHE に持ち帰り、自分たちの測定器でテストされてはどうでしょうか。最初から自分たちで作ろうとする苦労はしないで下さい。私はこの実験について、彼らの論文を英訳しているとき、大森と水野とも議論しましたが、これは見かけよりずっと難しい実験です。ステップごとに学ばなければいけません。できるだけやりやすい方法から入っていけば成功する可能性が高まります。

以上申し上げた、うまくいかなかった実験の例は NHE で行われた Pons- Fleischmann の沸騰実験にも見られます。Stanley Pons 等の直接の手助けにもかかわらず、また 20 回も試みたのに再現できませんでした。しかし、SRI(15)とフランスの原子力委員会(CEREM)(16)のどちらもこの実験再現に成功しています。NHE では失敗したのに、なぜ SRI と CEREM ではうまくいったのでしょうか。理由はつぎのように考えて良いのではないでしょうか。

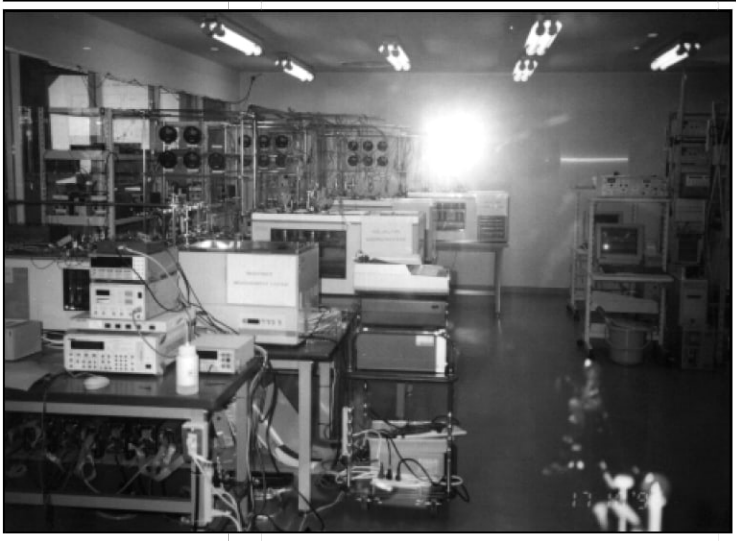
1. SRI の Mckubre は電気化学の専門家であるということ。
2. CEREM の LONCHAMPT 達は、Pons(17)によればこの特定の実験を4年間続けているということ。
3. Lonchampt は最後の電線一本に至るまで頑固なまでに技術者式に正確に再現を望んだということ。勝手に「創造的」な改良をやらず、全てを元の通りにしたということです。すなわち、まず課題をマスターすること、それからはじめて自分自身の変更を付け加えることです。

私は NHE 研究所で観察したのですが、NHE の沸騰実験セルと Pons Fleischmann のセルの違いがいくつか目に付きました。まず、Pons Fleischmann のセルは上半分が銀メッキされています。私は NHE のセルが失敗した理由として装置、あるいは実験方法のどちらがまずいのかはわかりませんが、他の二つのグループが再現に成功していることから考えて、やはり NHE の方法が間違っているのではないかと思います。

もし NHE がもっと手助けを得ることができれば、また、まったく同じガラス製品や電極を用いることができれば、あるいはフランスで何度も成功したセルや電極で練習してそれをうまく持ち帰れば、NHE の実験は CEREM と同様に沸騰実験がうまくいっていたに違いありません。そして経験を積むことが大切です。今から戻ってやり直しても遅くはありません。実験するのなら、まず身近にいる大森のような、もっと、簡単な信頼性の高い方法から始められることを強く提案いたします。



Above: Japan's New Hydrogen Energy Laboratory in Sapporo, Hokkaido. After the ICCF6 conference, attendees went on a guided tour of the facility. Building also houses IMRA Japan. Located in a "technology park" area.



Right: A laboratory room at the NHE laboratory in which multiple cold fusion cells, highly instrumented, were being run simultaneously in temperature-stabilized baths. *Photos: EFM*

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AquaFuel and "COH_2" Synthesis Gases — More Patents, New Measurements, Speculation....

by Eugene F. Mallove

The story of synthesis gas from carbon arcs-in-water has gotten much, much better and bigger than we had expected. First, it's now not just Bill Richardson's "AquaFuel" gas that we are talking about.

Our AquaFuel article and printing of the Richardson patent in *IE*#9 brought a response from many enthusiastic people, including David Wallman of Colorado and Wilbur Dammann of Nebraska (both joined as DW Energy Research, LLC), who have their own take on the wonder gas. They call it "COH_2" for its CO and H_2 dominant species. They too generate their gas underwater and with a carbon arc. They also have a significant patent position (U.S. #5,159,900 and #5,417,817), which we document here by reproducing both patents on pages 39-44.

Dammann and Wallman have been more particular in how they generate and control their arc, employing sensors of various kinds, and electromechanical control, to produce steady gas-producing conditions. But the really remarkable addition they bring is the use of biomass materials dissolved or dispersed in water as the source of the carbon! They alternate the arc polarity as carbon alternately builds up on one electrode and erodes from the other. Not only is this a very elegant way of feeding the arc with carbon, it also makes use of *virtually free fuel*—biomass, which of course comes from solar energy ultimately. Read the patents. They're lovely.

Wallman cites instances in which corporations now routinely pay contractors to remove biomass waste. Example: Coca Cola™ and Pepsi™ bottling centers must get rid of sugary wastes. Bingo! Better-than free fuel for their carbon arcs.

O.K, so the water is free, the biomass might be "nearly free," the US certainly has plenty of it, as do many other places, but the electricity to run the arc certainly isn't free—at least not yet! Recall that our main focus in *IE*#9 was asking whether the energetics of AquaFuel (and now COH_2 synthesis gas) were such that the chemical energy in the gas (when released by burning with air) could exceed the electric input and perhaps exceed even the *combined energy of electricity and chemical energy of carbon.*

We had intended to do a full-up replication of Bill Richardson's set-up with a 2200 watt electric load on a Coleman generator driven by a 5HP Briggs and Stratton engine—we even went out and bought such a unit from WalMart. We still intend to do that.

COH_2 Generator of DW Energy Research

Fortunately, we got diverted when Wallmann and Dammann agreed to perform calorimetric tests on their gas that we recommended. Their report is attached (pp.34-35).

Lacking an absolute "bomb calorimetric" method, the next best approach was to do a direct comparison between the heating value of a gas of known value —e.g. propane— and the unknown gas. Since Wallman and Dammann, both experienced electrical engineers, had been routinely successfully measuring their DC input power, they were ideally set up to do the experiment. Though their results are preliminary and subject to possible revision later, they found for COH_2 an energy efficiency of 132% to 144% over the electric input power. They found that their gas looks more like a >500 Btu/ft^3 gas rather than the <300 Btu/ft^3 that nominal gas composition—undoubtedly similar or identical to Richardson's AquaFuel—would seem to indicate. Bill Richardson, incidentally, kindly made a video tape—at my request— to document the fact that AquaFuel in an oxy-torch cuts right through steel—acting just like acetylene. (However, on further reflection this may not be an indication of energy content over 1,000 Btu/ft^3, because a hydrogen/oxygen torch certainly cuts steel—hydrogen is low in volumetric energy content.)

Note that chemical engineer Gerhard Knapp has performed an excellent analysis (pp.35-37) based on assumed composition from the NASA testing. That analysis would seem to suggest "ordinary performance", i.e. <300 Btu/ft^3, but in our view, because we *may* be dealing with novel scientific mechanisms here, we cannot trust a straightforward chemical-engineering projection based on the gas-chromatograph-determined composition.

The mysterious (>100%) high efficiency of the Wallmann/Dammann measurements based on chemical output energy alone, conceals, we realized, an even greater source of excess energy—the heat entering the water in the generation apparatus. The two liters of water in their generator rise about 100 °F in from 3 to 6 minutes due to arc-heating. Thus, there is a Btu addition to the water of from 75 to 150 Btu/minute. Note that the total output chemical energy in the COH_2 gas generated in an hour is from 4,300 to 4,700 Btu. But the energy dumped into the water may be in the range 4,500 to 9,000 Btu per hour! That means that the efficiency over the electrical input energy would be from 270% to 420%. Using Knapp's value of -14,114 Btu/lb of carbon reaction energy with water, the fact that the gas is about 50% CO and CO_2, and the 240 liter/hours generation rate for COH_2, implies about 2,000 Btu/hour of energy input from the carbon.

Now we gingerly approach the eerie conclusion that there may well be indicated here from these rough but possibly adequate measurements a <u>scientific over-unity condition</u> of from 160% to 260%—more energy out in terms of water heating and gas energy than combined electrical energy and carbon chemical energy in. And we haven't even considered escaping radiant energy—intense illumination from the arc.

If that were really so, from where would the excess energy come? Nuclear reac-

Continued on page 48

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NEWS RELEASE
Octobers 1996

Biomass Gasification Process Uses Rapid Oxidation to Convert Biomass into Environmentally Friendly Gas

A new Biomass Gasification Process converts biomass derived feedstock solutions into a hydrogen-based gas for use as a chemical raw-material, industrial fuel, and a potential transportation fuel. (Biomass is vegetation or plant-based organic material.)

This gasification process opens a significant group of under-used and discarded resources for conversion into profitable products. These resources include agricultural by-products and wastes, as well as other biomass sources.

The gasification process uses rapid oxidation to convert 100% of a biomass solution into a form of synthesis gas, in one stage of operation. The biomass solution is converted to gas through an endothermic reaction that produces no waste or residue. This reaction is the result of an electro-thermo-chemical process that is easily implemented and scaled to any needed size. No tars or oils are produced with this process as with current gasification processes.

Preliminary testing indicates the gas produced from this rapid oxidation process requires less energy to produce than methods now in use; system efficiency is greater than 90% (energy-in vs. energy-out).

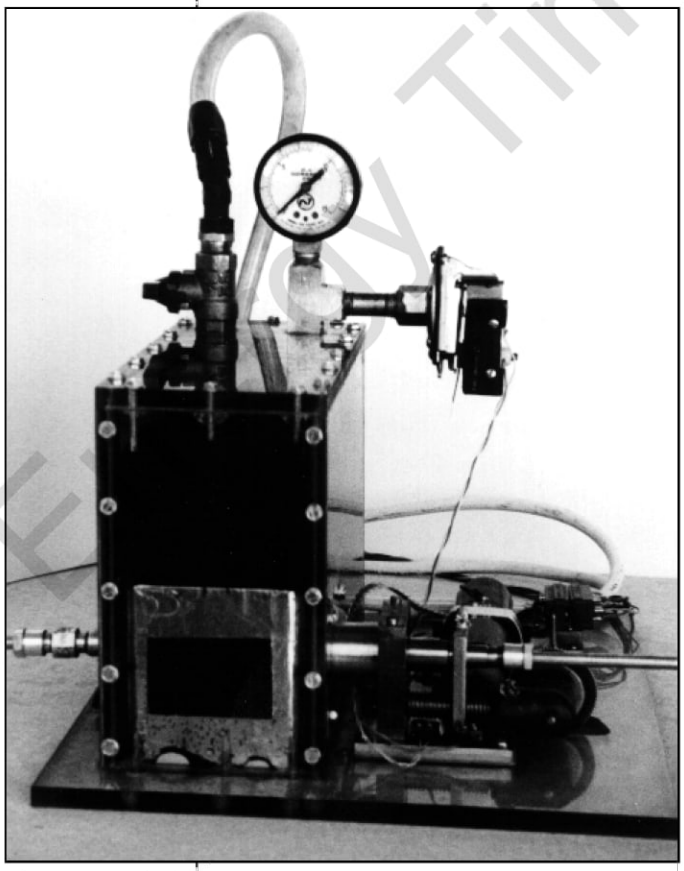
When the gas is used as a fuel in internal combustion engines, the combustion products of this oxygenated gas are carbon dioxide and water vapor. And, since this gas is derived from biomass, the carbon dioxide produced during combustion does not contribute to the net accumulation of carbon dioxide in the atmosphere. The biomass gasification system can use a wide variety of biomass in the conversion process including: carbohydrate solutions, agricultural waste and by-products, as well as feedstock solutions currently used to produce ethanol.

Biomass Gasification Features:

- **Gasification is a rapid, one-stage operation**
- **Gas is derived from under-utilized renewable resources (not dependent on fossil fuels)**
- **On-demand production (storage not required)**
- **Gas is a chemical raw-material**
- **Easily implemented process**
- **Gas used as fuel produces no pollution**

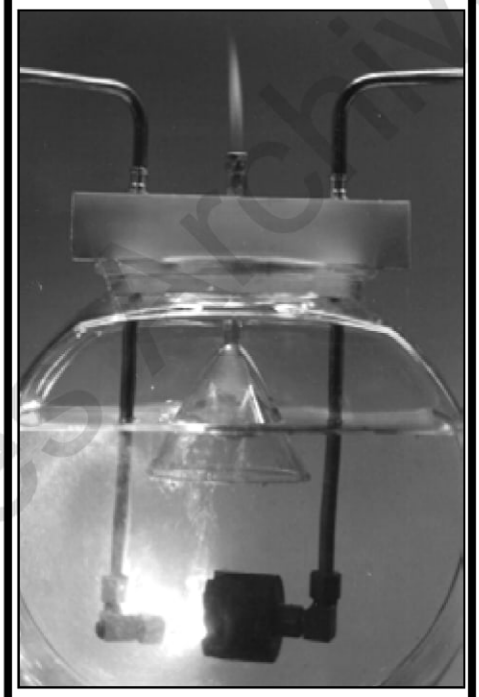
There are numerous applications for this gas because it is a chemical raw material that can be used in other chemical processes. A few of the major applications include:

- **Hydrogen production**
- **Comrnercial carbon dioxide**
- **Industrial fuel**
- **Fuel cells**
- **Production of biodegradable plastics (National Renewable Energy Laboratory)**
- **High grade pharmaceutical manufacturing**
- **Transportation fuel**
- **Conversion to methanol**
- **Methanol-to-gasoline production (MTG), currently used in New Zealand**
- **Cogeneration systems**



Biomass Gasification Reactor— ***A prototype reactor containing a biomass solution. Electrodes are inserted on the left and right sides. The mechanism on the lower right side controls the electrodes. Gas exits through the tube on top of the reactor. A pressure gauge and switch monitor gas pressure. This prototype generates 10 liters of gas/minute.*** •

AquaFuel Hands On!



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Preliminary Calorimetry Testing to Determine Energy Content of COH_2

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Summary of BTU content of COH_2 generated from biomass as compared with propane:

Preliminary testing was performed using 50 ml of distilled water, burning 1 liter of gas at a constant 5 psig using a small torch with no air applied except ambient. [Ed. Note: psig means pressure in lbs/in^2 above standard atmospheric pressure, 14.7 lbs/in^2 , hence 5 psig = 19.7 lbs/in^2] Tests D through F were conducted with an aluminum container using 200 ml of distilled water, burning 1 liter of gas at 5 psig. The temperatures were monitored using a laboratory type centigrade thermometer. A two-chamber container with a capacity of 1.45 liters in each chamber was used to measure the gas volume by displacing water from one side. The two chambers are sealed from each other except for a passage at the bottom. The right side chamber is used for gas volume measurement. It has been calibrated in 0.05 liter marks. At start, the air was evacuated through a valve at the top of the left (air) side chamber and water was pulled into the right (gas) chamber through a valve on top of this side. Sufficient water was drawn in to fill the right side and approximately 0.25 liter on the left side. All air was purged from the right chamber, the gas line to the reaction chamber (or to the propane tank). An air compressor was connected to the left chamber through the valve on top. The air regulator was adjusted to 5 psig. This method kept the gas at a fairly constant pressure as it was being filled or burned off.

Water for each run was from a storage container at ambient temperature. The test flask was dumped and then cooled in a container of water at ambient temperature prior to filling for the next run. The right (gas) chamber was marked with two marks — HI and LO, the volume between the two marks was 1.0 liter. Gas was filled to below the LO mark. For each run the torch (or Bunsen burner) was started and gas was burned off until the level reached the LO mark. Simultaneously the flame was placed under the flask and the timer was started. The gas was allowed to burn until the level reached the HI mark, at which time the flame was removed and the timer was stopped. The water in the [calorimeter] flask was stirred with the thermometer during heating.

Test A 50 ml water in glass flask 1 liter COH_2 at 5 psig.

Run	Start Temp° C	End Temp° C	Delta-T °C	Burn Time
1	11	34	23	1' 33" (1 minute, 33 sec)
2	11	38	27	2' 19"
3	11	34	23	1' 28"
4	11	38	27	2' 24"
5	11	37	26	2' 10"
6	11	34	23	1' 9"
7	11	35	24	2' 8"

Average Delta-T = 24.7°C

Test B 50 ml water in glass flask, 1 liter propane at 5 psig.

Run	Start Temp° C	End Temp° C	Delta-T °C	Burn Time
1	10	68	58	1' 37"
2	10	68	58	1' 35"
3	10	68	58	1' 36"

Average Delta-T = 58°C

Test C 50 ml water in glass flask 1 liter propane at 5 psig.

Run	Start Temp° C	End Temp° C	Delta-T °C	Burn Time
1	10	76	66	6' 26"

Test D 200 ml water in aluminum container, 1 liter Propane at 5 psig. Using torch.

Run	Start Temp° C	End Temp° C	Delta-T °C	Burn Time
1	10	74	64	2' 27"
2	10	77	67	2' 24"
3	10	72	62	2' 18"
4	10	73	63	2' 20"
5	10	74	64	2' 21"

Average Delta-T = 64°C

Test E 200 ml water in aluminum container, 1 liter COH_2 at 5 psig. Using torch.

Run	Start Temp° C	End Temp° C	Delta-T °C	Burn Time
1	10	24	14	2' 18"
2	10	22	12	2' 03"
3	10	24	14	1' 56"
4	10	23	13	1' 52"
5	10	24	14	2' 20"

Average Delta-T = 13.4°C

Test F 200 ml water in aluminum container, 1 liter propane at 5 psig. Using Bunsen burner.

Run	Start Temp° C	End Temp° C	Delta-T °C	Burn Time
1	10	80	70	3' 41"
2	10	80	70	3' 42"
3	10	81	71	3' 41"
4	10	83	73	3' 39"
5	10	80	70	3' 33"

Average Delta-T = 70.8 °C

In Test A series the COH_2 burned with a dark blue flame almost invisible in bright light. The torch was placed approximately 5/8" from the bottom of the flask and the flame covered the bottom of the flask.

In Test B series the propane burned with a large yellow-orange plume with generation of much soot. The torch was placed approximately 1" from the bottom of the flask.

Test C was conducted with the flame adjusted low to contain the flame on the bottom of the flask. The flame was adjusted for flame length of approximately 1". The torch was placed 5/8" from the bottom of the flask. The long burn time cracked the flask and the test run was terminated. Only about 1/2 liter of gas was burned before termination.

For the following test series runs, D

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through F, the torch was adjusted to provide a constant burn rate. The rate of burn was preadjusted by the valve on the torch. The gas flow was turned on or off with the valve on the right side chamber.

In Test D series the torch was placed approximately 1.5" from the bottom of the container and the flame covered the bottom of the container with some lapping around the side.

In Test E series, the torch was placed approximately 5/8"from the bottom of the container and the flame covered the bottom of the container.

Test F series was conducted using a Bunsen burner to deterniine the difference in energy when [more] air was added to the gas at combustion. When using the Bunsen burner to burn propane, with the air adjusted for no yellow, the flame covered the bottom of the aluniinum container.

We could not use the Bunsen burner wıth COH_2, because the flame would tend to go down into the burner tube, there was still heat but no flame touching the container. When trying to use the Bunsen burner to burn COH_2, the air had to be almost completely off and the flow had to be faster to keep the flame from going down burning back into the Bunsen burner. (The flame would burn completely enclosed in the burner because of the oxygen content of the gas.) The air-to-fuel ratio for combustion of COH_2 is significantly lower than for propane gas.

Comparing Tests D and E, average Delta-T of propane with the average Delta-T of COH_2, both using the torch, provides the following ratio of energy: 64°C to 13.4°C = 4.78/1.

The textbook reference for propane heating value= 2440 - 2652 BTU/ft^3

2440/4.78 = 510.5 BTU (low)
2652/4.78 = 554.8 BTU (high)

Comparing Tests F and E, average Delta-T of propane (using Bunsen burner, air added) with the average Delta-T of COH_2 (using torch, no added air): provides the following ratio of energy:

70.8° C to 13.4° C = 5.28/1

The textbook reference for propane heating value= 2440 - 2652 BTU/ ft^3

2440/ 5.28 = 462.1 BTU (low)
2652/ 5.28 = 502.3 BTU (high)

Since COH_2 could not be used in the Bunsen burner, the calculations comparing Test E (torch - COH_2) and Test F (Bunsen burner - propane) are not a direct comparison.

We now redo our prior input energy versus output energy calculations using these new BTU figures. The temperature rise of the solution or generating equipment was not taken into account for efficiency calculations. Only electrical input energy was used.

INPUT ENERGY

Electrical input: 40 amps @ 24 volts
Time: 1 hour
Energy= 40 amps X 24 volts X 1 hr = 960 watt-hours

Conversion of Watt-hours to BTUs
Conversion factor for watt-hours to BTU: 3.413
Energy = 960 watt-hours
Energy In = 960 watt-hours X 3.413 BTUlwatt-hours
=3276.5 BTU

OUTPUT ENERGY

Gas output: 240 liters/hour
Conversion factor for liters to cubic feet (ft^3): 0.035316
Gas output in ft^3 = 240 liters X 0.035316 ft^3/liter = 8.48 ft^3

Energy content of COH_2 gas = 510.5 BTU/ft^3 (Test E/D low)
Energy Out (low) = 8.48 ft^3 X 510.5 BTU/ft^3 = 4329 BTU

Energy content of COH2 gas= 554.8 BTU/ft^3 (Test E/D high)

Energy Out (high) = 8.48 ft^3 X 554.8 BTU/ft^3 = 4705 BTU

EFFICIENCY (low)

Energy Out = 4329 BTU
Energy In = 3277 BTU

Efficiency = 132 %

EFFICIENCY (high)

Energy Out = 4705 BTU
Energy In = 3277 BTU

Efficiency = 144 %

For continuing news of AquaFuel and COH_2, watch forthcoming issues of *Infinite Energy*— Subscribe Today!

Editor's Note: *We are happy to publish the following report from subscriber Gerhard Knapp, who prepared it on his own volition. He made the understandable assumption that the composition of AquaFuel, as reported in the NASA test analysis, would allow a straightforward chemical engineering calculation of the energetics of this synthesis gas. However, on the frontiers of new scientific discoveries and mechanisms, this assumption may not be valid. Only time will tell! —EFM*

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Dear Dr. Mallove:

I've taken the liberty to analyse your "AquaFuel - A Wonder Fuel, but is it Over-Unity?" article in Issue 9 of *Infinite Energy*. In my opinion, the process is a variation of the well known Water-Gas reaction, and the data shows no evidence that the process is "Over-Unity."

All the data for this analysis came from your article. The heats of formation (δH_f) and the heats of combustion (H_c) are from *Perry's Chemical Engineering Handbook*, Sixth Edition, Tables 3-206 and 3-207.

In Table 1, I calculated the "Gross (Higher) Heating Value" (HHV) - or Heat of Combustion - for the 80 ft^3 of AquaFuel by using the Kennedy Space Center analysis. The total Heat of Combustion is 22,753 Btu, or 284.4 Btu/ft^3. *Perry's* lists 308 Btu/ft^3 for "water gas," which you referred to in your article as the closest cousin to AquaFuel. It is indeed a very close cousin, with 42.8% carbon monoxide and 49.9% hydrogen being the typical main constituent concentrations, according to *Perry's.*

In Table 2, I determined the elemental carbon content of the 80 ft^3 AquaFuel. My calculations shows that the AquaFuel contains 1.25 lb carbon. This is close to the 1.0 lb carbon use reported by the inventor, Mr. William Richardson.

In Table 3, I show that the majority (over 80%) of the AquaFuel energy comes from the carbon. The balance of the energy comes from the electricity used, less the energy lost as heat from the AquaFuel generator. Your comment on page 44, column 2, §2 " -- the total energy output over the input of electrical energy is over 6:1 --- " is close to the mark. Most of the total energy content of the AquaFuel comes

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from the carbon, and the amount of carbon used is the most critical factor in determining the energy balance. Using the 1.0 lb value for carbon usage, and the 1 kw-hr of electrical energy consumption supplied by Mr. Richardson, the out/in energy ratio is 1.30. Using the calculated carbon value of 1.25 lb, the out/in energy ratio drops to 1.08. Based on the relatively simple equipment shown on the cover of your magazine, and based on the often experienced difficulties of getting accurate experimental data under the best of circumstances, I assume that these ratios are within experimental error, and that the data does not support evidence for over-unity energy generation.

The Briggs and Stratton Engine test analysis in Table 4 shows that the results are as expected, based on standard engineering evaluation. My estimated fuel-energy consumption to produce the 1.28 kw-hr electrical power produced in the test is 23,000 Btu. This assumes 95% generator efficiency (mechanical input to electrical output) and 20% engine efficiency (fuel input to mechanical energy output), for an overall efficiency of 19%. The 80 ft^3 AquaFuel used for the test contain 22,800 Btu, which matches my estimated fuel requirement. If the AquaFuel energy content had indeed been 134,000 Btu, as shown on pg 45, column 1, of your article, the fuel to electrical power efficiency of the motor-generator would be only 3.3%, which is unreasonable low.

The AquaFuel process is an interesting way to carry out the classical, and in earlier times much used, water gas process, where steam is passed over hot coal, and converted to hydrogen and carbon monoxide by the following reaction:

$$H_20 + C \text{ --> } H_2 + CO$$

In the AquaFuel process, I assume that the heat is supplied by electricity through a carbon electrode, which also supplies the carbon for the reaction. The carbon is used up in the process, and it supplies the majority of the AquaFuel energy.

The last page of this article describes the classical "Water-Gas Process." I used published heats of formation and heats of combustion for the reactions to further explain the overall process of using energy + water + carbon to produce fuel gas.

The Briggs and Stratton pollution test data is interesting. Two factors contribute to the cleaner burning of the AquaFuel: First, gaseous fuels burn cleaner than liquid fuels. It is much easier to obtain the correct air-fuel mixture needed for clean combustion with gaseous fuel. This is one of the reasons for the promotion of natural gas fueled vehicles. The second reason for the success of this particular test appears to be the large amount of excess air used during the combustion of AquaFuel. This is shown by the very high (7.1%) oxygen concentration in the exhaust gas. The engine ran very lean, and also very clean, with AquaFuel, compared to the run with gasoline. It is well known that lean engine operation reduces all combustion related pollutants, such as CO, hydrocarbons and nitrogen oxides. A spark ignition engine will normally however not run when operated lean (with excess air), due to the inability of getting good ignition. It could be that the large amount of hydrogen in the AquaFuel makes ignition easier, and enables an engine to run with large amounts of excess air. If this is the case, the use of AquaFuel could take advantage of both factors which reduce pollution: On the one hand, it is a gas, and on the other hand, it can burn with large amounts of excess air.

There are additional considerations that need to be addressed about air pollution. Since the AquaFuel process converts hot carbon to a combustible gas, many impurities in the carbon became part of the AquaFuel, and will subsequently cause pollution when the AquaFuel is used. The most important impurity in coal is sulfur - which pollutes the AquaFuel exhaust gas with oxides of sulfur. Similar pollution is caused by nitrogen compounds in the carbon, and by various halogens and metals.

I've obviously had to limit my evaluation to my knowledge of this subject, to the data available in your article, and to standard engineering calculations. My calculations indicate that the reaction to make 80 scf AquaFuel requires 1.38 kw-hr electrical energy. During the Briggs and Stratton Engine-Generator test, 1.28 kw-hr electical energy were generated from 80 scf AquaFuel, which is not sufficient to make the AquaFuel in the first place. In addition, the process consumes somewhere between 1 and 1.25 lb carbon. My evaluation does of course not ascertain that there may not be other factors at work.

Sincerely yours,
Gerhard F. Knapp

ANALYSIS

The net heat release for the two reactions (1 + 2), in Btu/lb of carbon, is calculated in the following manner: One (1) mole carbon = 12gm; 453.6 gm = one (1) lb. Therefore, -94.05 Kcal/mole x 453.6/12 x 3.97 Btu/Kcal = -14,114 Btu/lb carbon.

The published value for the heat of combustion of one lb carbon (reaction 3) is 14,087 Btu/lb. The small difference of 27 Btu/lb is insignificant, and due to rounding errors.

By using the same calculations for reaction 1 and reaction 2, we find that the first reaction, which has +31.38 Kcal/mole heat of reaction, requires 4,709 Btu/lb carbon either as direct heat, or through the use of 1.38 kw-hr electrical energy. The kw-hr value shown is based on the standard conversion factor of 3,413 Btu/kw-hr. The second reaction liberates -18,823 Btu/lb carbon. The net heat of reaction for making "WaterGas" is the difference between the heats for the two reactions, or -14,114 Btu/lb carbon.

There is no net water production in the overall reaction. The amount of water generated in reaction 2 was initially consumed in reaction 1 to form hydrogen and to supply oxygen for the carbon monoxide. The "extra" energy liberated in reaction 2 from the combustion of hydrogen is the energy needed to decompose the water in reaction 1.

1.) δH_f = heat of formation, Kcal/mole
2.) δH_r = heat of reaction, Kcal/mole
3.) H_c = heat of combustion, Kcal/mole

Infinite Energy
needs your contribution of articles, letters, and suggestions.
Thank you!

Water-Gas Reaction

								Heat of Reaction
Reaction 1	C	+	H_2O	-->	CO	+	H_2	$\delta H_r^{1)}$, Kcal//mole
$\delta H_f^{1)}$, Kcal/mole			-57.79		-26.41			+31.38
Reaction 2	CO	+	H_2	+ O_2 -->	CO_2	+	H_2O	
δH_f	26.41				94.05		-57.79	-125.43
				Net Heat, Reaction 1 + 2:				-94.05 Kcal/mole

Combined Reaction 1. and 2:

$$C + \cancel{H_2O} + \cancel{CO} + H_2 + O2 \text{ --> } \cancel{CO} + H_2 + CO_2 + \cancel{H2_O}$$

Reaction 3 (carbon combustion): $C + O_2 \text{ --> } CO_2$ $\quad H_c^{3)} = -94.05$ Kcal/mole

Table 1: Heat of Combustion, or HHV (Higher Heating Value), of AquaFuel

Basis: 80 scf* AquaFuel
379 scf per mole

AquaFuel	Vol%	scft*	MW**	lb	HHV*** Btu/lb	HHV Btu
Hydrogen	46.48%	37.19	2	0.1962	60,958	11,962
Carbon dioxide	9.33%	7.46	44	0.8664	0	0
Ethylene	0.05%	0.04	28	0.0029	21,625	63
Ethane	0.01%	0.00	30	0.0003	22,304	7
Acetylene	0.62%	0.49	26	0.0338	21,460	725
Oxygen	1.16%	0.93	32	0.0786	0	0
Nitrogen	3.82%	3.05	28	0.2257	0	0
Methane	0.18%	0.14	16	0.0061	23,861	146
Carbon monoxide	38.37%	30.70	28	2.2678	4,344	9,850
	100.01%	80.01		3.68		22,753

HHV/scf AquaFuel = 22,753 Btu/80 scf = 284.4 Btu/scf

scf*: standard cubic feet, measured @ 14.7 psia & 60oF
MW**: molecular weight
HHV***: Higher (gross) Heating Value, Btu/lb, H2O (liquid) and CO2 (gas)

Table 2: Carbon Content of AquaFuel

Basis: 80 scf AquaFuel, Carbon MW = 12

AquaFuel	Vol%	scf	mole carbon	lb carbon
Hydrogen	46.48%	37.19	--	--
Carbon dioxide	9.33%	7.46	0.0197	0.2363
Ethylene	0.05%	0.04	0.0002	0.0025
Ethane	0.01%	0.00	0.0000	0.0003
Acetylene	0.62%	0.49	0.0026	0.0312
Oxygen	1.16%	0.93	--	--
Nitrogen	3.82%	3.05	--	--
Methane	0.18%	0.14	0.0004	0.0046
Carbon monoxide	38.37%	30.70	0.0810	0.9719
	100.01%	80.01	0.1039	1.25 lb carbon/80 scf

Table 3: AquaFuel Production - Energy/Heat Balance

Basis: 1 kw-hr electricity consumption (article)
1 lb carbon consumption (article)
1.25 lb carbon consumption (calculated)
80 scf AquaFuel generation (article)

Energy/Heat Input		Carbon Consumption article 1 lb		calc. 1.25 lb
HHV carbon, in Btu/lb	14,087			
Heat supplied by carbon, Btu		14,087		17,609
Electrical heat, Btu/kw-hr	3,413			
Heat supplied by electricty, Btu		3,413		3,413
Total Energy/Heat In, Btu		A = 17,500	B =	21,022
Energy/Heat Output				
HHV AquaFuel, Btu/scft	284.4			
Heat liberated by 80 scf AquaFuel, Btu		22,753		22,753
Total Energy Output, Btu/80 scf AquaFuel		C = 22,753	C =	22,753

Energy Output/Energy Input: C/A = 130% C/B = 108%

Table 4: Briggs & Stratton Engine + Generator Test.

Basis: 80 scft AquaFuel used during test
Generator Output: 2.2 kw
Engine Operating time: 35 min
Electricity Produced: 1.28 kw-hr
Overall efficiency (fuel -> electricity): 19%

Generator output, kw-hr	---	1.28
Generator efficiency	95%	---
Engine output, kw-hr	---	1.35
Engine efficiency	20%	
Engine Energy input, kw-hr	---	6.74
Heat/Electricity conversion, Btu/kw-hr	3,413	---
Engine Energy input, Btu	-------->	22,993
Energy content of 80 scf AquaFuel, Btu (from Table 1)	---------->	22,753

Editor's Note: We are glad to publish the following observation and speculation about AquaFuel. Once again showing the power of *Infinite Energy* to focus a broad-based technical assessment on a critical issue.—EFM

Paul E. Rowe, Ph.D.
971 West Way
Mashpee, MA 02649

December 2, 1996

Dear Eugene,

I read your article on pages 44 and 45, V. 2, No. 9 of *Infinite Energy* with great interest. You report that the AquaFuel produced by William H. Richardson, Jr. using an underwater arc between carbon electrodes had the analysis given in the following Table. **[see Table on following page]** I calculated and included the relative atomic content of the gas.

For each oxygen atom in the gas there is only 1.603 hydrogen atoms. Since the source of hydrogen is, almost certainly, water one might expect this number to be close to two.

The discrepency can be most easily explained by assuming the production of complex, non-gaseous carbon compounds which contain more than twice as many hydrogen atoms as oxygen atoms. I will suggest a more unconventional explanation.

The presence of nitrogen may indicate that some air above the water was included. This would account for about 1/4 X 7.36 or 1.84 atoms of oxygen, leaving 57.516 O to have been produced from water. This would predict 115.15 atoms of hydrogen and still indicates a considerable lack of hydrogen.

Richardson's claim to have produced 80 cu. ft. of AquaFuel with 1.0 kwh. of electricity led me to perform the following calculation:

1.0 kwh = 8.6001 X 10^5 gm. cal. = 860.01 kcal.
1 cu. ft = 2.831677 X 10^4 cc.

So:

80 cu. ft. =226.53416 X 10^4 cc.
But
1 mole = 22400 cc. at STP
and
80 cu. ft. = 101.13 moles.

The Table indicates that 46.483% of the gas was H_2 so 47.008 moles of hydrogen gas was produced. [not including hydrogen in other molecules which contained hydrogen atoms.]

So, at least 47 moles of water were elec-

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Gas	vol %	Relative atomic Parts H	O	C	N
H_2	46.483	92.966			
CO_2	9.329		18.658	9.329	
C_2H_4	0.049	0.196		0.098	
C_2H_6	0.005	0.030		0.010	
C_2H_2	0.616	1.232		1.232	
O_2	1.164	2.328			
N_2	3.818				7.636
CH_4	0.181	0.724		0.181	
CO	38.370		38.370		
Total	100.015	95.148	59.356	49.220	7.636
	Total atoms = 211.36				

trolysed by 1 kwh of electricity (or 860 kcal. of energy).

$47\ H_20 = 47\ H_2 + 23.5\ O_2$

Samuel Glastone "Thermodynamics for Chemists" D. Van Nostrand Company (1947), p. 77 includes the following:

$H_2(g) + 1/2\ O_2(g) = H_20(l)$, $\Delta H = -68.31$ kcal.

Then
$H_20(l) = H_2(g) + 1/2\ 0_2(g)$ $\Delta H = 68.31$ kcal

and
$47\ H_20(l) = 47\ H_2(g) + 23.5\ O_2(g)$ $\Delta H = 3200.7$ kcal.

Richardson claims to have employed 860.01 kcal. So insufficient energy appears to have been used to produce the observed results. He should have needed at least 3200.7/860.1 = 3.72 times as much energy.

I have produced unexpectedly large quantities of hydrogen gas by detonating high explosives containing aluminum powders in vacuum. Other experimenters (some quite well known and highly respected) have reported unexpected quantities of hydrogen being produced during electrical discharge experiments. These results led me to speculate that, under the proper conditions, hydrogen gas can be produced from vacuum [P. E. Rowe, *J. New Energy*, vol. 1, No. 2, p.108 (1996)].

More recent experiments (not yet reported) have lead me to suspect that considerable energy is absorbed when hydrogen is produced from vacuum (or the ether). If this is the case, considerable energy would be produced if hydrogen were to be converted into vacuum (or the ether).

Richardson's experiments appear to produce more hydrogen and more energy than appears possible. I suggest that the following explanation be considered:

1. The arc in water electrolyses the water into hydrogen and oxygen atoms.
2. Some of the hydrogen atoms combine with other atoms producing hydrogen and other molecules and releasing energy.
3. Some of the hydrogen atoms enter the vacuum (or space, or the ether) producing much more energy.
4. This energy dissociates much more water into hydrogen and oxygen atoms.
5. These atoms react with each other, or water or carbon from the electrodes producing all the molecules found by Richardson.
6. Some of the hydrogen atoms become part of the ether.

As pointed out earlier, the number of hydrogen atoms in AquaFuel, based on the number of oxygen atoms, is much less than expected. Some of this discrepency may be due to conversion of hydrogen but not oxygen into ether.

Very Truly Yours,
Paul E. Rowe

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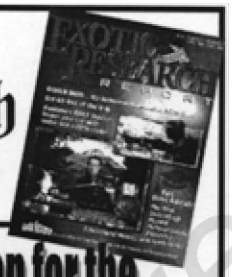

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United States Patent Number: 5,159,900
Date of Patent: Nov. 3, 1992

METHOD AND MEANS OF GENERATING GAS FROM WATER FOR USE AS A FUEL

Inventor: Wilbur A. Dammann, 1115 Carriage Rd., Papillion, Nebr. 68046
Appl. No. 697,413
Filed: May 9, 1991

Int. Cl.[5] F02B 43/08
U. S. Cl.....123/3;204/129; 204/225; 204/278; 204/294
Field of Search.....123/3, DIG. 12; 204/101, 129, 225, 242, 278, 294, 170

References Cited
U.S. PATENT DOCUMENTS

Re. 28,547	9/1975	Pacheco	123/3
887,989	5/1908	Weber	123/3
1,327,495	1/1920	Smith	123/3
1,529,764	3/1925	Bamber	123/3
1,716,084	6/1929	Percy	180/69.5
1,795,670	3/1931	Odell et al.	123/3
4,141,694	2/1979	Camacho	48/61
4,181,504	1/1980	Camacho	48/197
4,279,710	7/1981	Coughlin	204/129
4,333,423	6/1982	Firey	123/23
4,361,474	11/1982	Shoaf et al.	123/3
4,472,172	9/1984	Sheer et al.	48/202
4,487,683	12/1984	Bozzuto	208/8
4,566,961	1/1986	Diaz et al.	204/168
4,588,850	5/1986	Mueller et al.	585/539
4,690,743	9/1987	Ethington et al.	204/168

FOREIGN PATENT DOCUMENTS

765517	9/1980	U.S.S.R. .
1467234	3/1989	U.S.S.R. .

OTHER PUBLICATIONS

Okada et al., "On the Electrolysis of Coal Slurries," *Journal of the Electrochemical Soc.*, vol. 128, No. 10, Oct. 1981, pp. 2097-2102.

Coughlin et al., "Hydrogen Production from Coal, Water and Electrons," *Nature* vol. 279, May 1979, pp. 301-303.

Primary Examiner—Noah P. Kamen Attorney, Agent, or Firm—Zarley, McKee, Thomte, Voorhees & Sease

ABSTRACT

A method and means of generating gas from water for use as a fuel wherein a pair of spaced-apart carbon electrodes are positioned in a reaction chamber having water therein. Electrical current is supplied to the carbon electrodes to create an electrical arc therebetween causing the electrodes to burn and oxidize to form carbon monoxide and hydrogen. The gas is generated on an on-demand basis.

METHOD AND MEANS OF GENERATING GASFROM WATER FOR USE AS A FUEL

BACKGROUND OF THE INVENTION

This invention relates to a method and means for the generation of gas for use as a fuel for internal combustion engine More specifically, this invention relates to a method for rapidly generating fuel gas from water and carbon.

It is the applicant's belief that a mixture of carbon monoxide and hydrogen (COH_2) is a gas which will burn very clean in oxygen or air, and that the gas may be used as a fuel for an internal combustion engine. When burned, COH_2 produces carbon dioxide and water vapor, thereby adding very little, if any, pollution to the environment.

If COH_2 gas is produced for use as a fuel for an internal combustion engine, a problem arises in the storage of the same which maybe a fuel hazard. In order to eliminate the storage problem, it is desirable to produce the gas on an on-demand basis.

It is therefore a principal object of the invention to provide a method and means for the on-demand generation of gas from water and carbon for use as a fuel for a internal combustion engines.

A further object of the invention is to provide a method and means for forming COH_2 gas.

Yet another object of the invention is to provide a method and means for the on-demand gas generation: from water by oxidizing carbon in water, hereby producing COH_2 gas.

Still another object of the invention is to provide a processs for the on-demand generation of gas from water for use as fuel for internal combustion engines which is safe to use and which eliminates storage problems associated with such a process. These and other objects of the invention will be apparent to those skilled in the art.

SUMMARY OF THE INVENTION

The apparatus and method of the present invention serves to convert carbon and water into a fuel gas (COH_2) on-demand as required to sustain the operation of an internal combustion engine. The gas is released rapidly and the amount of the same is controlled by the electrical energy input into the carbon electrodes. The dangerous gas storage problem is eliminated because the gas is produced on-demand. Only a sufficient amount of gas to operate the internal combustion engine is produced at any time. Anti-pollution devices are not required as the gas burns pure and clean.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic diagram of the gas generation unit of this invention:

FIG. 2 is a diagram illustrating the gas generation unit of this invention interfaced with an internal combustion engine;

FIG. 3 is a sectional view of the gas reaction chamber illustrating the carbon rods positioned therein.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In FIG. 2, the numeral 10 refers to a conventional internal combustion engine capable of burning COH_2. Engine 10 may supply power to a vehicle, an electrical generator or a heat pump or the like, referred to generally by the reference letter P. For the purpose of this disclosure, the engine 10 will be described as being a component of a vehicle including a battery 12 and an alternator 14. In order to provide COH_2 gas for the engine, a gas generation unit 16 is provided which is in communication with a water supply or source 18.

In FIG. 1, the numeral 20 refers to a conventional computer or microprocessor which is electrically connected to a power sensor 22 by line 24. Power sensor 22 is operatively connected to a source of electrical power such as the battery 12 by any convenient means. Power sensor 22 senses the voltage across the electrodes 24 and 26 and senses the current flowing therethrough. This information is fed to the microprocessor 20 which in turn controls the operation of the servo drive 36 as will be described in more detail hereinafter. Electrode 24 is fixed in position within the reaction chamber 32 while electrode 26 is mounted on a servo shaft 34 which is controlled by the servo drive 36 to vary the distance between the electrode 24 and 26. Servo drive 26 is controlled by microprocessor 20 through lead 37.

Reaction chamber 32 includes a temperature sensor 38 which is connected to microprocessor 20 by lead 40. Water level sensor 42 is also provided in reaction chamber 32 for sensing the level of water in chamber 32 and which is connected to microprocessor 20 by lead 44.

Gas line 46 is in communication with the upper interior of chamber 32 ad extends to a gas/water separator 48 having gas line 50 extending from the upper end which includes a pressure regulator 52. Line 52 extends to the internal combustion engine for combustion therein. Water return line 54 extends from the bottom of separator

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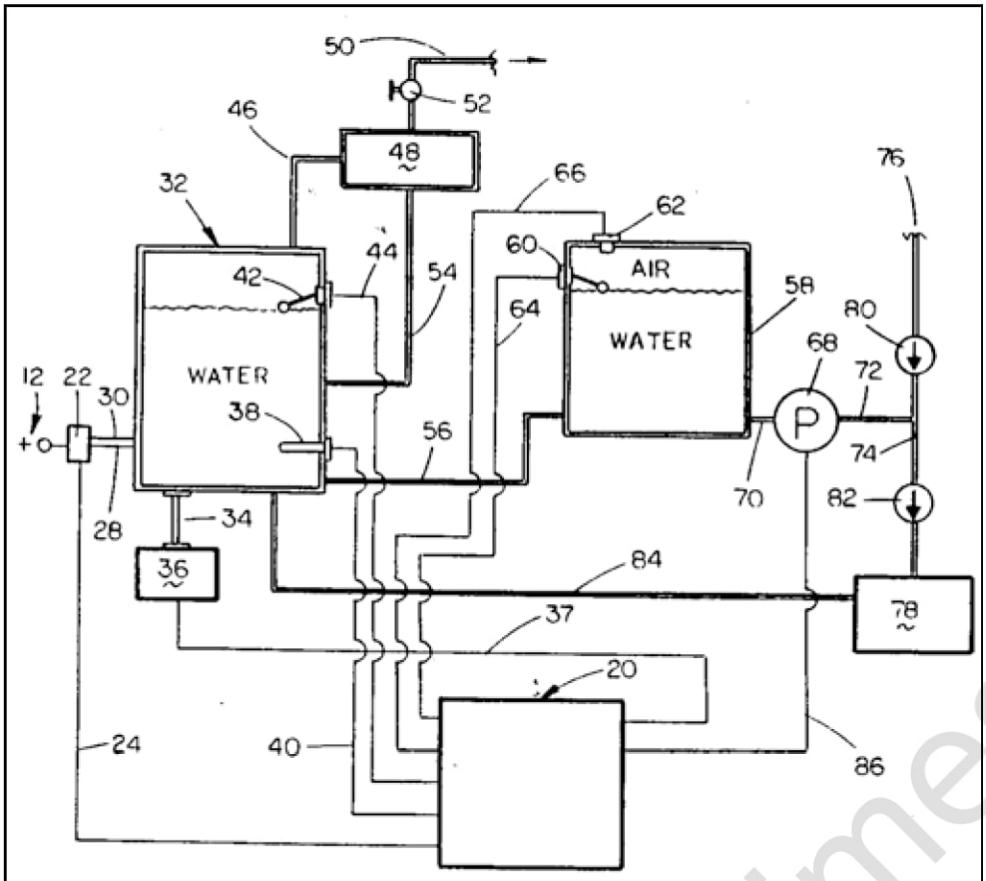

FIG. 1

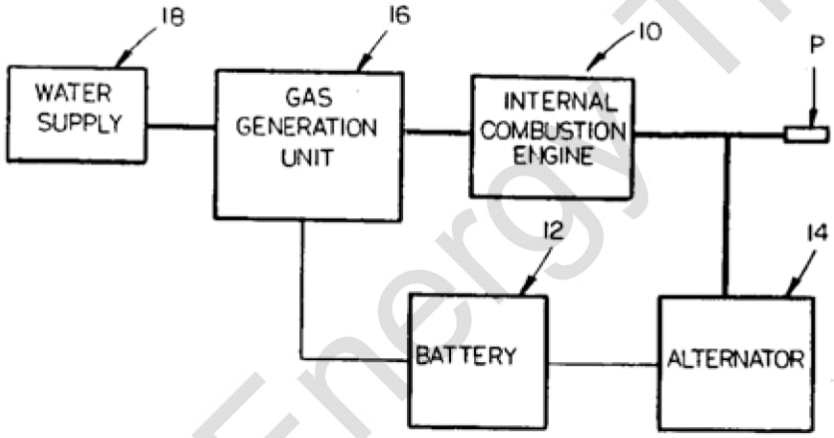

FIG. 2

458 to chamber 32 to return water thereto after separation of the water and gas in separator 48.

Water line 56 extends from the lower end of chamber 32 to expansion chamber 58 to permit water to flow between chamber 32 and chamber 58 as the water within chamber 32 expands due to pressure within chamber 32 when the gas is produced therein.

Water level sensor 60 and air pressure sensor 62 are provided in chamber 58 (FIG. 1) and are connected to microprocessor 20 by leads 64 and 66 respectively. Pump 68 is connected to chamber 58 by water line 70 and has water line 72 extending therefrom to water line 74. Water line 74 is connected to a source of water referred to generally by the reference numeral 76. Line 74 is fluidly connected to water cooler 78 and has check valves 80 and 82 imposed therein in the locations seen in FIG. 1. Water cooler 78 is connected to the lower end of chamber 32 by water line 84. Pump 68 is controlled by rnicroprocffsor 20 through lead 86.

In operation, the processs starts when power is supplied to the electrodes 24 and 26. The microprocessor 20 checks all sensor inputs such as the temperature sensor 38, water level sensor 44, water level sensor 60, pressure sensor 62, etc. If the pressure within expansion chamber 58 is within its specified range, the reactor will not be activated. Further, if the water level and temperature are within the preferred operating range, the pump 68 will not be activated. Microprocessor 20 continuously checks the signals from the sensors and initiates a response when any signal indicates need.

If the pressure is below the specified range as senud by the sensor 62, microprocessor 20 initiates the servo drive 36 to move carbon electrode 26 toward or away from carbon electrode 24 to achieve the optimum for the most efficient operation monitoring the feedback from the reactor power sensor 22. This operation continues until the signal from the pressure sensor 62 indicates that the pressure is within the operating range.

The signals from the water level sensors 42 and 60 and the temperature sensor 38 is monitored continuously. The pump 68 functions to add water to the system or circulate water through the cooler 78. The direction of the pump operation determines the function. Water level takes precedence over temperature.

If the water levels falls below the required point, as indicated by the combined logic of the two level sensors 42 and 60, pump 68 is operated in the reverse mode and moves water from the external water supply through the directional check valve 80 to the expansion chamber 58. This operation ceases when the level sensor 60 signals indicate proper value.

If the temperature sensor 38 indicates high water temperature, microprocessor 20 controls the pump to run in a forward direction, thereby circulating water through the check valve 82 and the water cooler 78 back to the reaction chamber 32. This operation continues until the temperature sensor signal is within normal operating range or low water level is sensed. The water replenishing and cooling functions operate simultaneously with reactor operation. If the ignition of the vehicle is turned off while the reaction is operating, the microprocessor controls the servo drive to back off the electrodes before shutting down the system.

The gas generation unit of this invention provides constant pressure gas at a specified volume. Instantaneous demand determines the rate of operation. The gas production is on a fully off-on basis, and is intermittent during periods of low and moderate fuel consumption. A buffer volume is maintained at a level to provide the instantaneous requirement. The pressure and volume of: the gas reserve is relatively small and does not pose a safety hazard.

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The process operates only when the vehicle ignition is on.

The reaction is controlled by the microprocessor 20 to provide optimum output with minimum electrical energy input. Battery 12 provides electrical power for the microprocessor and the reactor. Intermit-tent substantial power is required only when the reactor is operating. When the engine is operating, the battery is continuously being charged by the alternator 14.

The microprocessor 20 causes electrical energy to be supplied to the carbon electrodes 24 and 26 and when the electrodes are in the proper position, an electrical arc passes there between with the temperature of the electrical arc perhaps exceeding 6000°F. The heat and difference of potential between the carbon electrodes ionizes the carbon of the carbon electrodes. The conduction current burns the carbon to produce a flame. Oxidation (burning with a flame) of the carbon combines carbon and oxygen forming carbon monoxide. When this process is performed under water, it withdraws oxygen from the water, thereby liberating the hydrogen therefrom. The result is the rapid release of hydrogen and carbon monoxide gas. This process releases the gas from the water on-demand as previously stated. The amount of gas being produced is directly proportional to the flame and the electrical energy producing it. The carbon monoxide when mixed with hydrogen forms COH_2 gas which burns very clean in oxygen or air. When burned, COH_2 provides carbon dioxide and water vapor thereby substantially reducing pollution to the environment.

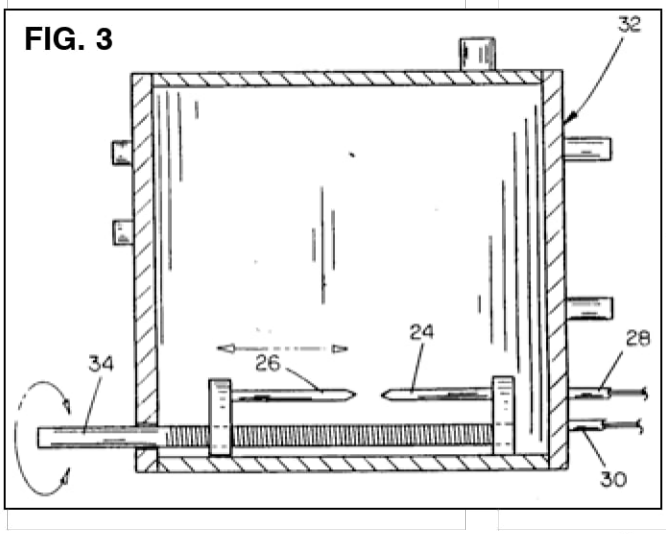
The carbon rod electrode utilized in the above-identified method will be consumed during the oxidation process. Thus, it will be necessary to replace the carbon electrodes as they become consumed. An alternate concept is to use high temperature non-oxidizing electrodes rather than the carbon rod electrodes and to provide a carbon rich feedstock solution utilized in the reaction. For example, such a carbon rich feedstock solution could be $C_6H_{12}0_6$ or $C_{12}H_{22}O_{11}$. The only problem with utilizing such a feedstock solution is that the carbon in this form is not electrically conductive. The feedstock oxygen-carbon molecular composition is balanced, as in $C_6H_{12}0_6$ or $C_{12}H_{22}0_{11} + H_2O$ and conductive carbon is added to the reaction chamber, as in $C + C_6H_{22}0_6$ or $C + C_{12}H_{22}O_{11} + H_2O$, the reactive carbon will be replenished from the feedstock as the hydrogen is displaced in the rapid oxidation process. If so, carbon will remain in the reaction chamber to provide an electrical current path, with only the requirement being that feedstock solution be added to the chamber as it is consumed in the process.

Thus it can be seen that the invention accomplishes at least all of its stated objectives.

I claim:

1. A gas generation unit for providing gas for an internal combustion engine, comprising:
   a reaction chamber having water there in,
   a pair of spaced apart carbon electrodes in said reaction chamber immersed in the water therein,
   means for supplying electrical current to said carbon electrodes to create an electrical arc therebetween whereby the carbon electrodes will burn and rapidly oxidize to from carbon monoxide and hydrogen.
2. The gas generation unit of claim 1 wherein means are provided for varying the distance between said carbon electrodes.
3. The gas generation unit of claim 2 wherein a computer means controls said means for varying the distance between said carbon electrodes.
4. A gas generator unit for providing gas for an internal combustion engine, comprising,
   a reaction chamber having a feedstock solution therein,
   a pair of spaced-apart carbon electrodes in said reaction chamber immersed in the feedstock solution therein,
   said feed stock solution being comprised of a mix ture of water and electrical conductive carbon,
   and means for supplying electrical current to said electrodes to create an electrical arc therebetween whereby the carbon electrodes will burn and rapidly oxidize and whereby the carbon in said feedstock solution will burn and rapidly oxidize to form carbon monoxide and hydrogen.

FIG. 3



United States Patent
Number: 5,417,817
Date of Patent: May 23, 1995

BIOMASS GASIFICATION PROCESS AND APPARATUS

Inventors: Wilbur A. Dammann, 1115 Carriage Rd., Papillion, Nebr. 68046; W. David Wallman, 1350 Northface Ct., Colorado Springs, Colo. 80919

Appl. No.: 259,878
Filed: Jun. 15, 1994

Int. Cl.6 .....F02B 4.3/08

U.S.Cl.....204/129; 204/164; 204/168; 204/170; 204/173; 204/228; 204/242; 123/3

Field of Search.....204/164, 170, 173, 168, 204/129, 228, 242; 123/3

References Cited
U.S. PATENT DOCUMENTS

Re. 28,547	9/1975	Pacheco	123/3
603,058	4/1898	Eldridge et al	204/164
887,989	5/1908	Weber	123/3
1,327,495	1/1920	Smith	123/4
1,529,764	3/1925	Bamber	123/3
1,716,084	6/1929	Percy	123/3
1,795,670	3/1931	Odell et al	123/3
4,141,694	2/1979	Camacho	48/61
4,181,504	1/1980	Camacho	48/197 R
4,279,710	7/1981	Coughlin	204/101
4,333,423	6/1982	Firey	123/23
4,361,474	11/1982	Shoafetal	204/239
4,472,172	9/1984	Sheer et al	48/202
4,487,683	12/1984	Bozzuto	208/8
4,566,961	1/1986	Dim et al	204/168
4,588,850	5/1986	Mueller et al	585/539
4,690,743	9/1987	Ethington et al	204/168
5,159,900	11/1992	Dunn	123/3

FOREIGN PATENT DOCUMENTS

307529	8/1928	United Kingdom .
765517	9/1980	U.S.S.R.
1467234	3/1989	U.S.S.R. .

OTHER PUBLICATIONS

Okada et al., "On the Electrolysis of Coal Slurries," *Journal of the Electrochemical Soc.*, vol. 128, No. 10, Oct. 1981, pp. 2097-2102.

Coughlin et al., "Hydrogen Production From Coal, Water and Electrons," *Nature* vol. 279, May 1979, pp. 301-303.

Primary Examiner — Kathryn Gorgos
Assistant Examiner— Arun S. Phasge
Attorney, Agent, or Firm—Zarley, McKee, Thomte, Voorhees & Sease; Mark D. Frederiksen

ABSTRACT

An apparatus for a gasification of a biomass liquid

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solution includes a reaction chamber having a biomass liquid solution therein. The biomass solution includes at least water and carbon. A pair of spaced apart carbon electrodes are immersed in the solution within the chamber. A direct current electrical supply is connected to the electrodes to form an electrical arc passing from one electrode to the other and thereby oxidizing carbon of one electrode. The oxidized carbon forms a carbon monoxide and hydrogen gas mixture, and carbon released from the biomass solution during oxidation is deposited on the opposite electrode. A switch is interposed between the source of electric power and the electrodes so as to selectively switch the polarity of the electric arc to thereby cause oxidation of the opposite electrode and the deposit of carbon on the previously oxidized electrode while continuing to manufacture COH_2 gas. A sensor detects the position of the electric arc, and thereby detects the length of the oxidizing electrode, and is electrically connected to a control unit which will cause the switch to change polarity of the electrodes when the oxidizing electrode reaches a pre-determined length. The biomass solution may be formed from a mixture of water with starches, sugars, carbohydrates, alcohols, and the like.

BIOMASS GASIFICATION PROCESS AND APPARATUS

TECHNICAL FIELD

The present invention relates generally to a method and means for the generation of gas for use as a fuel for internal combustion engines, and more specifically to a process for the gasification of a biomass feedstock for use as a chemical raw material and as a fuel.

BACKGROUND OF THE INVENTION

In U.S. Pat. No. 5,159,900, one of the inventors herein disclose a rapid oxidation process to produce a gas for use as a fuel from water and carbon. This gas product is created by the decomposition of water through oxidation. Hydrogen is displaced when a substance is oxidized in water. Rapid oxidation can be forced by using an electrical arc to burn a substance within a biomass feedstock solution, thereby oxidizing the substance by an electro-thermochemical reaction. The result is the rapid formation of a mixture of hydrogen and carbon monoxide gas (COH_2).

The COH_2 mixture is a gas which will burn very clean in oxygen or air, and therefore is desirable for use as a fuel in an internal combustion engine. When burned, COH_2 produces carbon dioxide and water vapor, thereby adding very little, if any, pollution to the environment.

As discussed in U.S. Pat. No. 5,159,900, a problem arises in the storage of COH_2 gas, and therefore it is desirable to produce COH_2 gas on an on-demand basks. U.S. Pat. No. 5,159,900 to Wilbur Dammann discloses the use of an electrical arc between two carbon electrodes submersed in water to produce the reaction necessary to rapidly oxidize carbon and produce COH_2 gas. Because the carbon electrodes were consumed during the reaction, there was no residue. Rather, the total of the water and carbon was changed to an oxygenated combustible gas. This process can be represented by the following equation: $C + H_20 \rightarrow CO + H_2$.

Thus, carbon and water are consumed during the reaction, without the production of residue. While water can be easily added within the reaction chamber without disrupting the reaction, the carbon electrodes cannot be replaced in the reaction chamber without disrupting the reaction.

SUMMARY OF THE INVENTION

It is therefore a general object of the present invention to provide a method for producing on-demand generation of gas from water and carbon for uses of fuel for internal combustion engines.

Another object is to provide a biomass gasification process and apparatus which continuously replenishes the carbon electrodes from a biomass feed stock, to avoid the need for replacing the electrodes.

Another object is to provide a method and apparatus for producing COH_2 gas from common biomass feed stock.

These and other objects will be apparent to those skilled in the art.

An apparatus for a gasification of a biomass liquid solution includes a reaction chamber having a biomass liquid solution therein. The biomass solution includes at least water and carbon. A pair of spaced apart carbon electrodes are immersed in the solution within the chamber. A direct current electrical supply is connected to the electrodes to form an electrical arc passing from one electrode to the other and thereby oxidizing carbon of one electrode. The oxidized carbon forms a carbon monoxide and hydrogen gas mixture, and carbon released from the biomass solution during oxidation is deposited on the opposite electrode. A switch is interposed between the source of electric power and the electrodes so as to selectively switch the polarity of the electric arc to thereby cause oxidation of the opposite electrode and the deposit of carbon on the previously oxidized electrode while continuing to manufacture COH_2 gas. A sensor detects the position of the electric arc, and thereby detects the length of the oxidizing electrode, and is electrically connected to a control unit which will cause the switch to change polarity of the electrodes when the oxidizing electrode reaches a predetermined length. The biomass solution may be formed from a mixture of water with starches, sugars, carbohydrates, alcohols, and the like.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic diagram of the gas generation unit of the present invention; and

FIG. 2 is a schematic diagram showing a sectional view of the gas reaction chamber and the associated switching mechanism.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, in which similar or corresponding parts are identified with the same reference numeral, and more particularly to FIG. 1, the apparatus for generating gas from water and carbon is designated generally at 10, and includes an electronic control unit 12 connected to a housing 14 which includes a reaction chamber 16 separated from a feedstock chamber 18.

A source of electrical power, such as a battery 20 is electrically connected through a power sensor 22 and a switch 24 to electrodes 26 and 28 (shown in FIG. 2). Power sensor 22 senses the voltage across the electrodes 26 and 28, and also senses the current flowing therethrough. This information is fed to control unit 12 via a conductor 30, which in turn controls the operation of a servo drive 32, as described in more detail hereinbelow.

Referring now to FIG. 2, electrode 26 is fixed in position in one side wall of reaction chamber 16, and extends inwardly into the reaction chamber. The second electrode 28 is mounted on a servo shaft 34 which is operable to slide inwardly and outwardly from chamber 16 by the servo drive 32, to vary the distance between electrodes 26 and 28. Servo drive 32 is electrically connected to control unit 12 via conductor 36, which controls the operation and direction of servo drive 32.

Reaction chamber 16 includes a pressure sensor 38 which is connected to control unit 12 by lead 40. A pair of position sensors 42a and 42b are mounted in reaction chamber 16 adjacent electrodes 26 and 28 respectively. Position sensors 42a and 42b are linked to compare the radiat-

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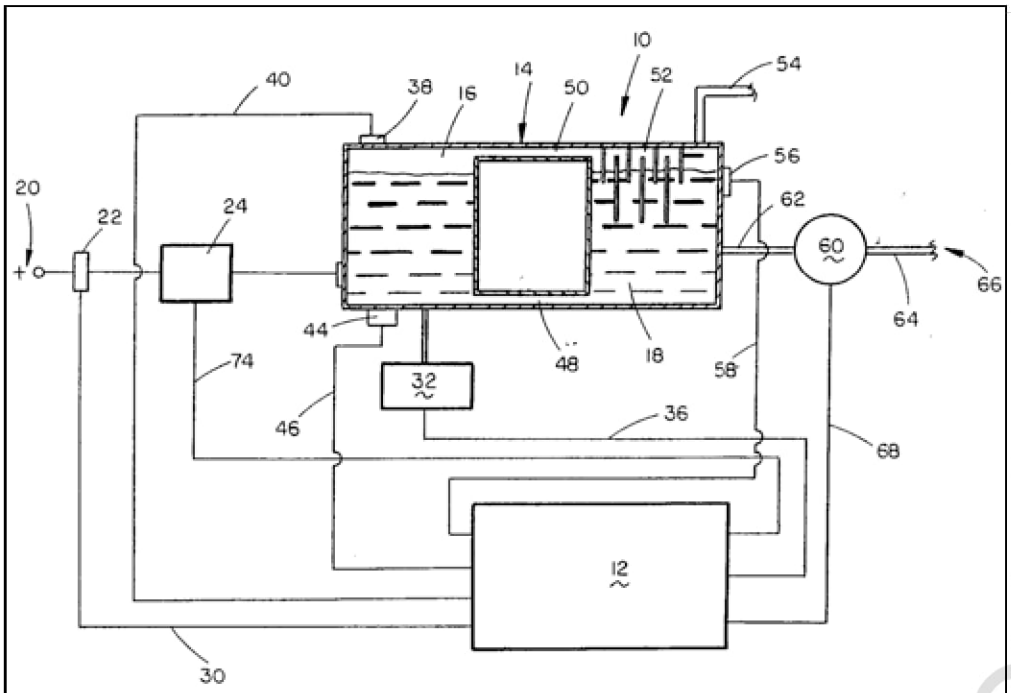

FIG. 1

ed energy of the electric arc extending between electrodes 26 and 28 at different locations, to determine the position of the arc within reaction chamber 16, and thereby determine the location of the ends of electrodes 26 and 28. Position sensors 42a and 42b are connected at a junction 44 and electrically connected to control unit 12 via conductor 46. As shown in FIG. 1, a lower passageway 48 extends between feedstock chamber 18 and reaction chamber 16, at the lower end of housing 14. An upper passageway 50 connects the upper ends of reaction chamber 16 and feedstock chamber 18. Upper passageway 50 extends directly from reaction 16 into a gas/water separator 52 located in the upper end of feedstock chamber 18. A gas line 54 is in communication with the gas/water separator and extends to a storage chamber or an internal combustion engine, to supply COH_2 gas to a predetermined location.

A water level sensor 56 is provided in feedstock chamber 18 and is electrically connected to control urlit 12 via lead 58. A pump 60 is connected to feedstock chamber 18 by waterline 62, and has a waterline 64 extending to a source of water, referred to generally by the reference numeral 66. Pump 60 is controlled by control unit 12 through lead 68.

Referring now to FIG. 2, switch 24 includes one conductor 70 connected to electrode 26, and a conductor 72 electrically connected to electrode 28. Switch 24 is utilized to switch the polarity of direct current (DC) electrical energy flowing through conductors 70 and 72 to electrodes 26 and 28. A lead 74 connects polarity switch 24 to control unit 12, which determines the timing for the switching of polarity.

In operation, power is supplied to control unit 12, the servo drive 32, pump 60 and electrodes 26 and 28. Control unit 12 checks all sensor inputs, such as power sensor 22, pressure sensor 38, position sensor 42 and water level sensor 56. Control unit 12 will continuously check these sensor signals and immediately initiate any necessary response required by the signals. For example, if the pressure within reaction chamber 16 is below a predetermined range, control unit 12 will initiate the servo drive 32 to move electrode 28 towards electrode 26 until the electrodes are at optimum spacing for most efficient operation, by monitoring the feedback signal from power sensor 22.

In U.S. Pat. No. 5,159,900, carbon electrodes were utilized to supply the carbon which was oxidized under water. As noted above, this required the replacement of the carbon electrodes in order to continue the reaction process. In the present invention, a carbon rich feedstock solution is utilized, such that the reactive carbon is continuously replenished within the reaction chamber. A source of feedstock, formed of a solution of water and carbon, is supplied through pump 60 to feedstock chamber 18. As the feedstock solution is rapidly oxidized in reaction chamber 16, the level of liquid within feedstock chamber 18 will also drop. This drop in liquid level is sensed by liquid level sensor 56, which is in turn transmitted to control unit 12. Control unit 12 will then supply an appropriate quantity of additional feedstock, via pump 60, to feedstock chamber 18.

While the inventors have experimented with the described process using a biomass feedstock solution of water and glucose ($C_6H_{12}0_6$), and water and sucrose ($C_{12}H_{22}0_{11}$), it is believed that any carbon rich solution would work well. Thus, carbon-based liquids and solutions including carbohydrates and alcohols would provide the necessary components for the feedstock. Carbohydrates such as cellulose, starches, sugars and glycogens are readily available for such use.

Many sources of biomass feedstock solutions can be used with the biomass gasification process. Plant materials such as cornstalks, wheat straw, wood, grasses, leaves, sawdust, and common "yard waste," may be converted into a feedstock solution. In addition, other organic substances, such as lignocellulosic materials (including agricultural waste such as manure, municipal solid waste, and residue from logging operations) may be effectively utilized.

During operation, rapid oxidation of carbon in water results in hydrogen molecules being displaced by carbon, which produces carbon monoxide and hydrogen gas. The carbon on electrodes 26 and 28 will be continuously replenished when utilizing a solution rich in carbon, hydrogen and oxygen. The inventors have utilized a

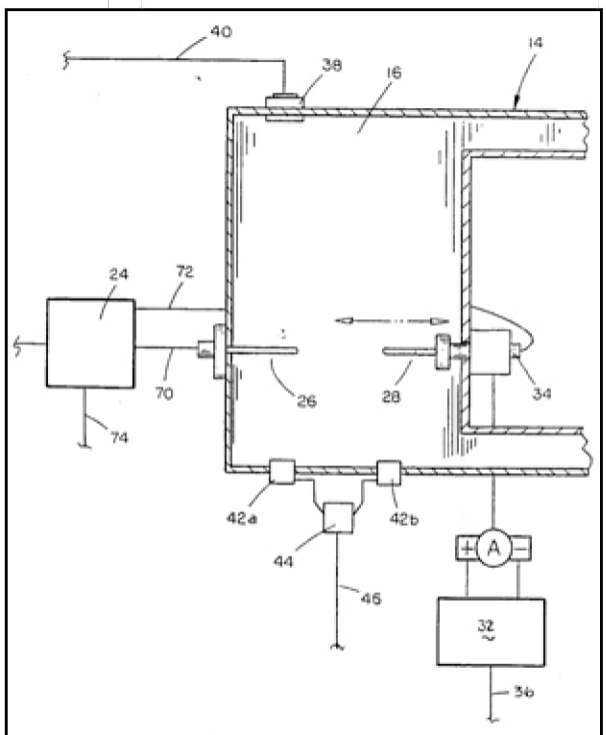

FIG. 2

solution of $H_2O + C_{12}H_{22}O_{11}$ during testing, and have found that carbon is deposited on the negative electrode as carbon is oxidized from the positive electrode during the reaction.

When utilizing alternating current, the inventors have found that oxidation of both carbon electrodes is equal and are consumed rapidly. The biomass feedstock solution of $H_2O+C_{12}H_{22}O_{11}$ turns dark from the suspended carbon that is released from the solution by the rapid oxidation reaction.

On the other hand, when utilizing direct current, the carbon from the solution is electroplated onto the cathode electrode as it is oxidized from the anode electrode. With proper voltage and current, the rate of electroplating is equal to the rate of oxidation. The solution remains clear and the cathode electrode increases length at the same rate that the anode electrode decreases in length.

Position sensors 42 are provided to transmit information as to position of the electrical arc extending between the electrodes, to thereby calculate the relative lengths of the electrodes. This information is fed to the control unit 12, so as to reverse the polarity of the current at predetermined positions. The polarity of the current is periodically changed during the reaction, so as to cause oxidation on the electrode which previously had been receiving carbon deposits, while electroplating the electrode which had been oxidizing carbon therefrom.

As discussed in more detail in U.S. Pat. No. 5,159,900 control unit 12 causes electrical energy to be supplied to electrodes 26 and 28, such that an electrical arc passes therebetween with the temperature of the arc perhaps exceeding 6,000°F. The heat and difference of potential between the carbon electrodes ionizes and vaporizes the carbon in an exothermic reaction. Electrons pass through the vaporized carbon, causing the carbon vapor to oxidize or burn. The displacement of oxygen in the water by forced rapid oxidation, an endothermic reaction, releases carbon monoxide and hydrogen gas.

Whereas the invention has been shown and described in connection with the preferred embodiment thereof, it should be understood that many modifications, substitutions and additions may be made which are within the intended broad scope of the appended claims.

We claim:

1. Apparatus for the gasification of a biomass liquid solution, comprising:

a reaction chamber at least partially filled with a biomass solution of at least water and carbon;

a pair of spaced apart carbon electrodes in said reaction chamber immersed in the biomass solution;

means for creating an electric arc between said electrodes by supplying a direct electrical current to said electrodes; and

switch means interposed between a source of electrical current and said electrodes for selectively switching polarity of the current supplied to the electrode.

2. The apparatus of claim 1, further comprising means for varying the distance between said electrodes.

3. The apparatus of claim 2, further comprising a control unit for selectively activating the means for varying the distance between the electrodes.

4. The apparatus of claim 1, further comprising a control unit for selectively activating the switch means to switch polarity.

5. The apparatus of claim 4, further comprising means for sensing the position of an electric arc within said reaction chamber.

6. The apparatus of claim 5, wherein said control unit includes means responsive to the position sensing means, to activate said switch means in response to set positions of an electric arc.

7. The apparatus of claim 1, further comprising means for sensing the position of an electric arc within said reaction chamber.

8. A method for the gasification of a biomass liquid solution, comprising the steps of:

supplying a reaction chamber with a quantity of a biomass liquid solution formed of at least water and carbon;

creating a direct current electrical arc within the solution extending from a first carbon electrode to a second carbon electrode to cause rapid oxidation of carbon from the first electrode and to form carbon monoxide and hydrogen and to release carbon from the biomass solu tion and deposit the released carbon on the second electrode;

sensing the lengths of the first and second electrodes; and

changing polarity of the electric arc when the first electrode is oxidized to a set length, to cause the second electrode to oxidize and deposit carbon ori the first electrode.

9. The method of claim 8, further comprising the step of controlling voltage and current to the electric arc such that the rate of oxidation of one electrode is substantially the same as the rate of deposit of carbon on the opposite electrode.

10. The method of claim 8, wherein the step of supplying a quantity of a biomass liquid solution includes the step of mixing sugar with water.

11. The method of claim 8, wherein the step of supplying a quantity of a biomass liquid solution includes the step of mixing starch with water.

12. The method of claim 8, wherein the step of supplying a quantity of a biomass liquid solution includes the steps of breaking down cellulose to extract glucose, and mixing the glucose with water.

13. The method of claim 8, wherein said step of depositing carbon on the second electrode includes electroplating said electrode with carbon released from the biomass solution by oxidation.

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UNITED STATES PATENT OFFICE.

HILLIARY ELDRIDGE, DANIEL JOHNSON CLARK, AND SYLVAIN BLUM, OF GALVESTON, TEXAS.

ELECTRICAL RETORT.

SPECIFICATION forming part of Letters Patent No. 603,058, dated April 26,1898. Application filed June 28,1897. Serial No. 042,701. (No model.)

To all whom it may concern:

Be it known that we, HILLIARY ELDRIDGE, DANIEL JOHNSON CLARK, and SYLVAIN BLUM, citizens of the United States, residing at Galveston, in the county of Galveston and State of Texas, have invented a new and useful Electrical Retort, of which the following is a specification.

Our invention relates to electrical retorts for manufacturing hydrogen gas from water to be utilized as a fuel for heating purposes. We construct the apparatus with electric appliances and with means for feeding water thereto, so as to produce an electric arc within a closed vessel containing a suitable quantity of water. The heat evolved by the electric arc and the electrolytic action of the electric current on the water operate to decompose the water into its component elements, hydrogen and oxygen. The gas thus produced is conducted to a suitable gasometer containing a water bath. The oxygen, freed by the decomposition of the water in the retort, unites or combines with the vaporized carbon evolved by the consumption of the anodes and cathodes of the retort and produces carbonic-acid gas, the major portion of which is "washed out" or absorbed by the water within the gasometer, to which the gas from the retort is conveyed.

The object of our invention is to provide a portable plant for manufacturing hydrogen gas in which the elements of the plant are simple in construction, easily operated and controlled, and assembled together in a manner to secure tight joints at all points to prevent the leakage and escape of the gas.

To the accomplishment of these ends our invention consists in the novel combination of devices and in the construction and arrangement of parts, which will be hereinafter fully described and claimed.

To enable others to understand our invention, we have illustrated a preferred embodiment thereof in the accompanying drawings, forming a part of this specification, and in which—

Figure 1 is a sectional elevation through a portable gas plant constructed in accordance with our invention. Fig.2 is an enlarged sectional view through the retort; and Fig.3 is a sectional view, on an enlarged scale, through the feed mechanism for the anode of the retort.

Like numerals of reference denote corresponding parts in all figures of the drawings, referring to which—

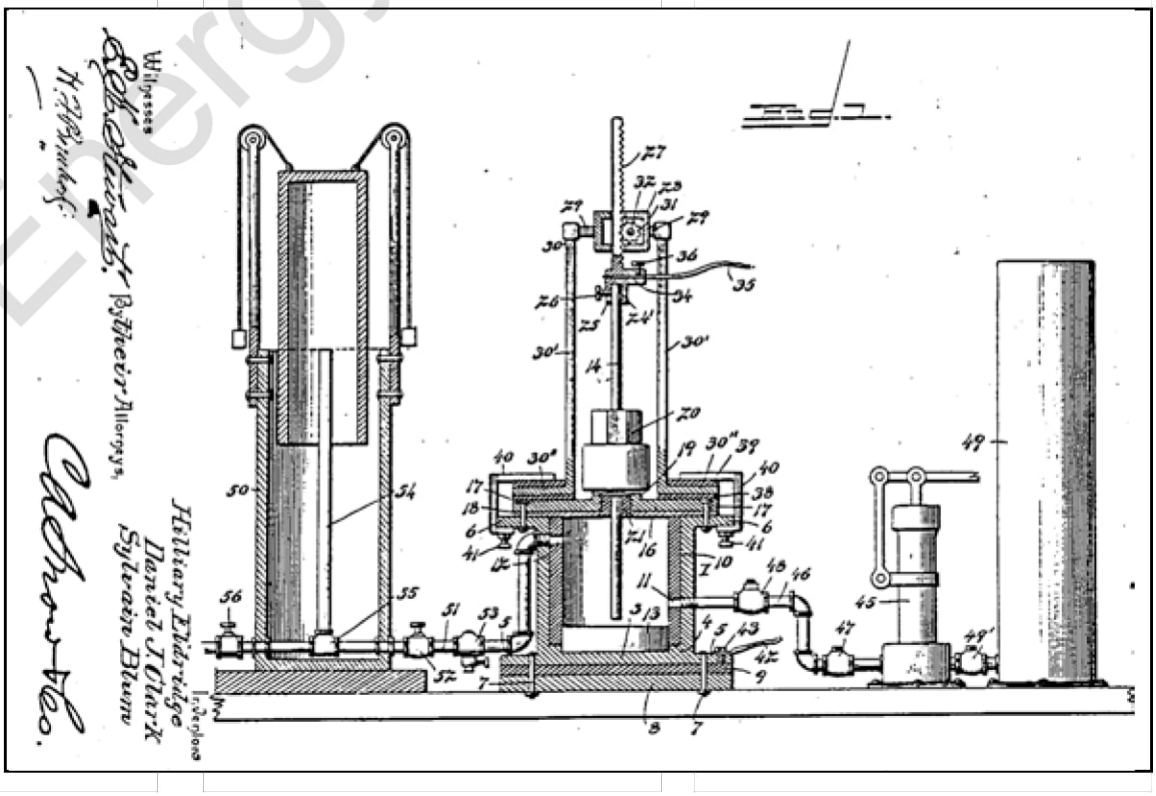
The numeral 1 designates the retort in its entirety, which is constructed in a novel manner to itself constitute the cathode of the electric appliances, and this retort is also constructed to receive the movable anode of the electric appliances in a manner to prevent the leakage of the gas evolved by the decomposition of the water within the retort.

The body of the retort consists of a cast-iron vessel or shell 2, preferably cylindrical in form. The bottom 3 of the retort is closed by a head, which is shaped to constitute an interior seat 4, and this cylindrical retort-shell has an annular flange 5 at its lower end and a similar flange 6 at its upper open end, The annular flange 5 at the base of the retort furnishes a means for receiving the bolts 7, which operate to fasten the retort to a tile foundation 8. On the foundation is placed the tile or tiles 9, upon which rests the base of the retort-shell 2, and through the base-flange 5 of the retort, the tile 9, and the foundation 8 pass the bolts 7, which serve to hold the retort solidly in place.

The interior of the retort-shell 2 is lined with a carbon lining 10 or other material refractory to heat. This carbon lining is of cylindrical form, and it rests snugly upon the interior seat 4 within the shell of the retort. The carbon lining 10 is pierced at one side, near its lower end, with an induction-port 11 for the water, and it is likewise provided with an eduction-port 12, the latter being situated at a point diametrically opposite to the water-induction port 11 and near the upper end of the retort.

The cathode or negative electrode 13 is in the form of a flat disk of carbon, which is fitted within the seat 4 of the retort, upon the bottom thereof. The cathode is shown as fitting snugly within the carbon lining 10 of the retort, and the parts 10 13 are thus fitted snugly together to be held from displacement within the retort.

The anode or positive electrode 14 passes through an insulated stuffing box on the cover of the retort, and this stuffing box is



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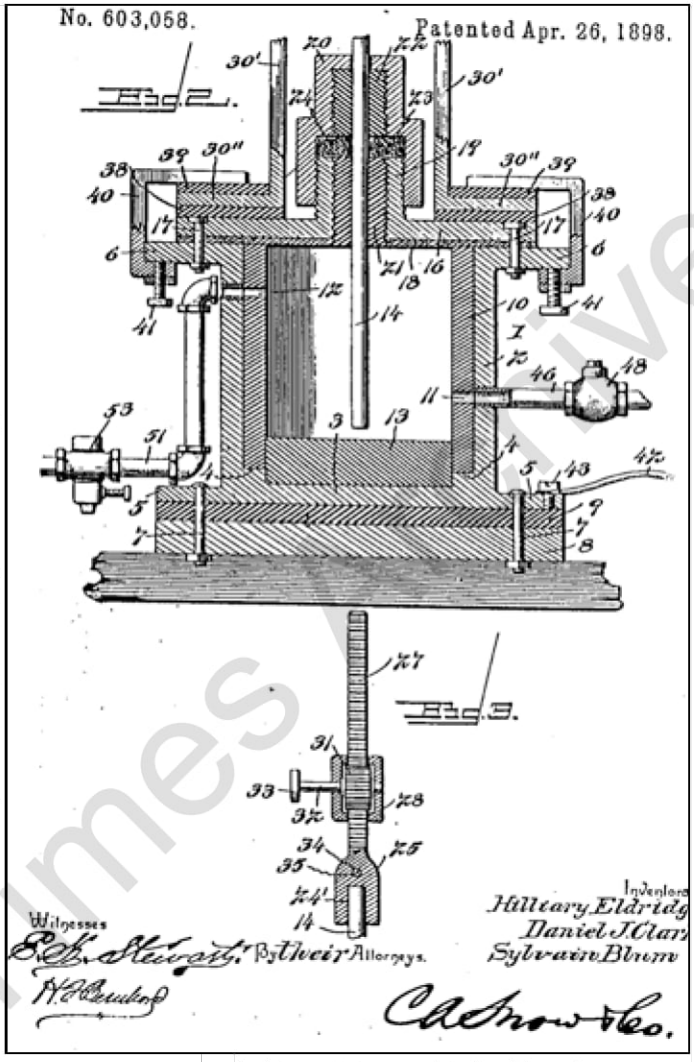
constructed in a novel manner to insulate the anode from the retort and to produce a tight joint to obviate leakage of the gas which may be generated in the retort.

The anode consists of a rod or pencil of carbon, and it is connected at its upper part to a carrier or holder 25, which is controlled by a suitable feed mechanism to adjust the anode within the retort as may be required. The supporting and adjusting devices for the anode will be presently described in detail.

The upper open end of the retort-shell 2 is designed to be closed by a cast-metal cover or head 16, which is fastened tightly upon the retort-shell by the through-bolts 17. To secure a tight joint between the retort-shell and its closure, we provide an asbestos packing 18 between the flange 6 and head 16, said packing being clamped between said flange and the cover or head 16 when the bolts are tightened. The cover or head 16 of the retort carries a stuffing-box, through which the anode 14 enters the retort. This stuffing box consists of a nipple 19 and the gland 20. The nipple 19 is formed integrally with the closure 16, and it extends upwardly therefrom at the center thereof. The nipple is crew-threaded interiorly to receive and hold the insulating-bushing 21, which is screwed into the nipple, and said nipple is also screw-threaded externally to adapt it to receive the gland 20. This gland is a casting having upper and lower parts of different diameters joined together by an integral shoulder, and the lower part of the gland 20 is threaded internally to enable said gland to be screwed upon the externally-threaded nipple of the stuffing-box. The upper smaller end of the gland 20 is screw-threaded internally to receive the threaded block of insulating material 22, which constitutes the upper bushing for the movable anode 14, said upper bushing 22 being held or fastened securely in the upper part of the gland 20 by reason of the screw-threaded connection of the busing with the gland. It will be observed that we have provided two insulating bushings 21 22 for the anode, one of which bushings is fastened within the nipple and the other bushing is fastened within the gland of the stuffing-box.

The insulating-bushing 21 22 within the stuffing-box are made either of asbestos, mica, or a substance known as "phonolite" to form an electric insulator, which is also refractory to heat.

The insulating bushings 21-22 are spaced apart vertically within the stuffing-box, and the gland 20 is arranged to be screwed on the nipple19, so as to provide a space or chamber above the nipple within the gland, which space or chamber is designated by the numeral 23. Within this chamber, in the gland of the stuffing-box, is placed a packing 24, of asbestos or other appropriate material, and this packing encompasses the anode 14, whereby the stuffing-box provides a tight joint against the leakage of gas from the retort, and it also serves to sustain the bushings that operate to electrically insulate the anode from the metallic vessel or shell of the retort. The stuffing-box packing 24 may consist of asbestos, as described, or we may use asbestos wool or asbestos rope or asbestos fiber mixed with a little fire-clay, which admixture makes the stuffing-box packing refractory to heat. The bushings 21 22 are pierced with vertical apertures, and said bushings are held within the members of the stuffing-box to bring the vertical apertures in the respective bushings in alignment with each other, whereby the anode 14 may readily pass through and have the desired vertical play within the bushings 21 22.



The upper extremity of the carbon anode 14 is fitted in a socket 24, provided in the lower side of the carrier or holder 25, said anode being made fast to the carrier by the employment of a clamping-screw 26. This carrier 25 has a rack-formed guide-rod 27, attached thereto or made integral part thereof, and this guide-rod passes vertically through a suitable aperture in a boxing or casing 28. Said boxing or casing is supported by the cross-arm 29 of a supporting-frame 30,which is erected upon the closure or head of the retort. Within the guide box or casing 28 is arranged and adjusting gear or pinion 31, which is carried by a shaft 32, that is journaled in said box or casing 28. This gear-pinion 31 meshes with the rack formed on one edge of the guide-rod 27 of the carbon-carrier 25, and the shaft 32 of said gear-pinion has an insulated hand-wheel 33, by which the shaft and pinion may be rotated to adjust the carrier 25 and the anode 14 vertically, as may be required. The carrier or holder 25 is provided with a transverse hole or socket 34, in which is fitted the end of one of the electric conductors 35, and this conductor is made fast to the carrier or holder 25 by a binding screw 36, which works in a threaded aperture in the carrier 25 and impinges upon the conductor 35, as shown more clearly by Fig.3.

The upright standards or legs 30' of the supporting frame 30 terminate at their lower ends in the feet 30", which rest upon the cover or closure 16 of the retort. The frame 30 is clamped to, but insulated from, said closure of the retort in the following manner: Between the feet 30" of the standards and the metallic closure 16 are interposed layers or strips of insulating material 38, and upon the upper sides of the feet 30" are placed other layers or strips of insulating material 39. The clamps 40 40 are arranged to embrace the feet of the supporting-frame 30 and the flange 6 of the retort, and said clamps are provided with binding screws 41, which operate against the flange 6 of the retort to draw the clamps tightly upon the feet 30" of the standards. It will thus be seen that the supporting-frame 30 is firmly but delicately held upon the closure 16 by the action of the clamps 40, and at the same time the

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supporting-frame is insulated from the cover 16 and from the clamps40, the latter being in electrical connection with the metallic shell or body 2 of the retort. The other conductor 42 of an electric circuit is attached directly to the integral base-flange 5 of the retort-shell 2, and said conductor 42 is held in place by means of the binding-screw 43, whereby the conductor is connected in good metallic contact with the metallic shell 2 of the retort. The current from the conductor 35 passes through the carrier 25 to the anode 14, thence to the cathode 13, and thence through the metallic retort-shell and its base-flange 5 to the conductor 42, thereby completing the circuit back to the generating-machine, battery, or other source of electric energy. Water is forced into the retort 1 by a pump 45 of any suitable construction. This pump 45 is mechanically connected with the retort by a pipe 46, one end of which is screw-threaded into the wall of the metallic shell 2 opposite to the water-induction port 11. This connection of the pipe 46 to the retort-shell provides a tight joint between the parts to prevent the escape of gas from the retort, and the port 11 in the refractory lining 10 provides for the convenient inlet of the water to the interior of the retort. The pipe connection 46 between the retort and the pump has a suitable stop-cock 47, and is also equipped with a check-valve 48, which responds only to the stroke of the pump, and thus overcomes any back pressure of gas or liquid from the retort. Water is supplied to the pump 45 from a suitable tank 49, having a valved connection 49' with the pump, as shown by Fig.1.

The gas generated within the retort is conducted to a suitable gas-holder or gasometer 50, which may be of any preferred construction. The gas is conducted from the retort to the gas the gasometer by a pipe connection 51, one end of which is threaded into the metallic shell 2 of the retort opposite to the gas-eduction port 12 in the refractory lining 10 of the retort, thus making a tight joint between the outlet-pipe and the retort. The other end of the pipe connection 51 is attached to the lower part of the water tank of the gasometer, and said pipe 51 is provided with a stop-cock 52 and with a petcock 53, both of which may be of any preferred construction. The stop-cock 52 may be closed when the gasometer has been charged with gas, and the petcock 53 may be opened when it is desired to discharge any surplus gas generated within the retort after the gasometer shall have been filled. This gasometer is constructed with a water-tank and with a vertically movable bell, as usual, and the gas delivered by the pipe connection with the retort is discharged into the gasometer by a vertical pipe 54.

The gas contained in the gasometer may be conducted to any suitable burner for consumption thereby through a connection 55 at the lower end of the gasometer, said connection having a suitable regulating-cock 56. The connection between cock 56 and the pipe that leads the gas to the consuming-burner should be on non-conducting material.

This being the construction of our gas-making apparatus or plant, the operation may be described, briefly, as follows: The electric current is admitted through the conductor 35and the anode 14, thence across the arc to the cathode 13, which is in electrical connection with the metallic retort-shell 2 and the other conductor 42. Before the current is admitted the anode is lowered to have its lower extremity rest upon and make contact with the cathode 13 by adjusting the gear-pinion that engages with the rack on the carrier ##, and this pinion is then reversed to raise the anode a suitable distance, the current thus establishing an arc between the elements 14 13 of the electrical appliances. The pump is now operated to inject water into the retort-chamber. The water is dissolved into its component elements, hydrogen and oxygen, by the heat evolved by the arc and by the electrolytic action of the electric current, and the oxygen, freed by decomposition of the water, unites or combines with the vaporized carbon evolved by the consumption of the anode and cathode, thus producing carbonic-acid gas. The gas generated within the retort is conveyed by the pipe 51 to the gasometer 50, and the major portion of the carbonic-acid gas is absorbed by the water bath in said gasometer.

We are aware that changes in the form and proportion of parts and in the details of construction, herein shown and described as the preferred embodiment of our invention, may be made by a skilled mechanic without departing from the spirit or sacrificing the advantages of our invention. We therefore reserve the right to make such modifications and alterations as fairly fall within the scope of our invention.

If desired, we can connect the retort by pipe connections to the exhaust pipe of a steam-engine should we deem it necessary to run a dynamo by means of a steam engine. This arrangement and adaptation of mechanisms will enable us to utilize exhaust-steam from an engine in case we desire to operate a steam plant to generate electrical currents to be used to operate the retort.

Having thus fully described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In a plant for manufacturing hydrogen gas by electrolysis, a retort having a closed chamber and conducting-bottom, a base insulated electrically from said retort, a closure or head also insulated from the retort, a cathode seated in electrical contact with the conducting bottom of said retort, and a packed insulating stuffing-box mounted on the head, in combination with an anode, electrical connections for the anode and cathode, and means for feeding water to the retort, substantially as described.

2. In a plant for manufacturing hydrogen gas by electrolysis, the retort having a conducting bottom and closed chamber, a disk-like cathode seated on the conducting bottom of the retort and in electrical contact therewith, an annular bottomless lining secured with the retort chamber to surround the cathode and having the water-induction port and the gas-eduction port, a stuffing-box supported on the head or cover of the retort above the cathode and carrying the vertically-aligned insulated bushings, an anode movable within said bushings of the stuffing-box and insulated thereby from electrical contact with said stuffing-box, a feed mechanism for the anode, and electrical conductors in contact with the retort and the anode, combined with a feed-pump connected with the water-induction port, a gasometer, and connections between the gasometer and the gas-eduction port from the retort and its refractory lining, substantially as and for the purposes described.

3. In a plant for manufacturing hydrogen gas by electrolysis, a retort comprising a metallic vessel having a head or cover, a two-part stuffing-box having one member rigid with said retort-head and the other member forming a removable gland, insulating-bushings fixed within the members of said stuffing-box and arranged in vertical alignment with each other, and a packing confined between the vertically aligned bushings, combined with an anode movable through the bushings and packing of the stuffing-box and insulated by said bushings from electrical contact with the stuffing-box, a cathode confined within the retort, and suitable electrical connections, substantially as and for the purposes described.

4. In a plant for manufacturing hydrogen gas by electrolysis, a retort having a head or cover, a stuffing-box having one member rigid with said head or cover and provided with an interior insulating-bushing, a stuffing-box gland coupled to the rigid stuffing-box member, another insulating-bushing secured within the stuffing-box gland and having a vertical opening in alignment with a similar opening in the rigid member of the stuffing-box, and a

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packing interposed between the insulating-bushings and confined by a gland within the stuffing-box, in combination with an a node movable through through said aligned bushings and insulated thereby from electrical contact with the stuffing-box, a cathode within the retort-chamber, and electrical connections, substantially as and for the purposes described.

5. In a plant for manufacturing hydrogen gas by electrolysis, a retort having a chamber and a cathode confined therein, a head or closure insulated from said retort, a two-part stuffing-box carried by said head or closure and containing vertically-aligned insulating-bushings and a packing confined between said bushings, a supporting-frame insulated from the head or closure, and clamps for holding said closure on the supporting-frame rigidly upon the retort, combined with a feed mechanism mounted in the supporting frame, an anode passing through the bushings of and insulated from electrical contact with a stuffing-box, and suitable electrical connections for the retort and said anode, substantially as and for the purposes described.

6. The combination with a retort vessel having a closure, and a cathode therein, of a supporting-frame resting upon, but insulated from, the retort-closure, a clamp embracing said retort vessel and the supporting-frame, but insulated from the latter, an anode, a carrier for said anode and provided with a guide-rack, a boxing supported on the frame, and a shaft carrying an adjusting-pinion, as and for the purposes described.

7. In a plant for manufacturing hydrogen gas by electrolysis, a retort having a tightly-closed chamber, and a two-part stuffing-box mounted on said retort and provided with insulating bushings and a packing, combined with an anode movable through the stuffing-box and insulated by the bushings therein, a cathode within the retort, electrical connections for said cathode and anode, and means for feeding liquid to said retort, substantially as described.

8. In an apparatus for manufacturing hydrogen gas by electrolysis, a retort having an insulated cover, an upright frame clamped to said retort and provided with a guide-head, and a stuffing-box mounted on the cover and having insulating-bushings in line with the guide-head, combined with an anode passing through the guide-head and stuffing-box, a feed mechanism for said anode, a cathode and electrical connections for said anode and cathode, substantially as described.

In testimony that we claim the foregoing as our own we have hereto affixed our signatures in the presence of two witnesses. HILLARY ELDRIDGE.

Four (4) two-hour VHS video tapes—**8 hours total viewing**— are available as a set, or individually. These were only slightly edited from professionally taken video footage of the day-long Cold Fusion session at MIT on January 21, 1995. The tapes include the following material:

TAPE#1

Dr. Eugene F. Mallove
(Cold Fusion Technology, Concord, NH)
"Cold Fusion and New Energy Technology - An Overview"

Dr. Peter Graneau
(Northeastern University Center for Electromagnetic Research) "Anomalous Forces in Water Plasma Explosions"

TAPE#2

Buford ("Ray") Conley
(MIT, graduate student, Dept. of Aero/Astro Eng.)
"Light Water Excess Heat Experiments"

Fred Jaeger
(ENECO, Salt Lake City)
"Patents and Commercialization"

Professor Peter L. Hagelstein
(MIT Dept. of Electrical Engineering and Computer Science) "Cold Fusion: What We Know and What We Don't Know"

TAPE#3

Professor Peter Hagelstein
(CONTINUED from TAPE #2)
"Cold Fusion: What We Know and What We Don't Know"

Professor Keith Johnson
(MIT Dept. of Materials Science and Engineering)
"Progress in the Theory of Excess Heat" *and Excess Heat*- The Movie, now being made by Hollywood!

James L. Griggs
(Hydro Dynamics, Inc., Rome, Georgia, USA)
"The Hydrosonic Pump: Excess Power and Other Effects"

TAPE#4

Bertil Werjefelt
(PolyTech(USA), Hawaii)
"Energy from Magnetic Materials and Magnetic Fields"

Dr. Eugene F. Mallove
(Cold Fusion Technology, Concord, NH)
Concluding Remarks

The tapes include the speakers' presentations as well as question and answer sessions. There is footage of the Hydrosonic Pump under test as well as close-up footage of rotor surface melting effects. Bertil Werjefelt shows footage of experiments in his own laboratory. There are scenes of Japanese researchers from Sumitomo, Hitachi, and other companies and universities now involved in their claimed extraction of energy from magnetic materials. These efforts are now said by these researchers to be proceeding toward commercialization. Actual experiments are seen in progress. The tapes are VHS cassettes in NTSC format and range from 120 to 127 minutes each.

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AquaFuel—Continued from page 32

tions? There is already significant evidence building up that carbon arcs both under water and in air may cause transmutations (see abstracts in this *IE*, p.55, of articles by Bockris et al, *Fusion Technology*, November 1994.) John Bockris himself speculates in this issue (p.61) that underwater arcs may be associated with the liberation of nuclear energy.

Of course, we don't know for certain that this AquaFuel or COH_2 generation process is over unity, so we should not too quickly draw conclusions. One conclusion is firm, however: *It is of the very highest priority to get to the bottom of the energetics of these reactions as soon as possible.* This could well be one of the biggest breakthroughs in new energy technology of the past seven years! As David Wallman told me, the optimization of the gas generation has not even been done. Indications of better performance at higher pressure are there already, so there is no telling what could come out of this. If the O/U were high enough, then self-sustaining—the implication of Richardson's patent— would be possible in a relatively simple system. Water-fueled cars would then be within very easy reach.

Let us not forget that even if these synthesis gases are not a scientifically over-unity process, they are remarkably clean-burning and useful—particularly with the added fuel source that Wallman/Dammann have pioneered.

We are already planning some other calorimetric approaches that will give a more definitive measurement of gas energy content. Others are working on that too. Bill Richardson is starting to sell equipment for people to conduct their own experiments. Soon there will be an army of people working on this. If this does not lead to a huge rush toward commercialization soon, I'd be very surprised.

Repetition of the underwater arc results of Bockris and others that show nuclear changes is now a mandatory, top priority experiment. So much is riding on this. Those with good analytical labs able to reproduce those results simply must do it.

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THE ADAMS-ASPDEN MOTOR PATENT

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Introduction

I first heard of Robert Adams and his motor at a mountain retreat north of Denver, Colorado during the days just before a New Energy Symposium. That was in April 1993. A benefactor interested in knowing the truths about 'free energy' and its potential for solving the world's pollution problems had funded the expenses of the invited speakers and the preliminary 'think tank' event at that retreat. My talk would be about magnetism and the aether as an energy source, but our 'think tank' groups each had an allocated theme. We were expected to point the finger at the best candidate for onward investigation, from the vague information and reports we had about discoveries and claims pertaining to the new energy world.

Yes, there were several to choose from, machines involving magnets and solid-state devices such as that devised by Hans Coler, dating from the World War II era, or the then-current activity of Sparky Sweet (now deceased). In fact, one of our team, a colleague from U.K., had visited Sweet just prior to that Colorado meeting. However, specific information as to how to build any of these devices was not available, nor was there any acceptable theoretical account of their operation on which we could recommend action.

Fortunately, however, someone had brought with him information publicized by the *Nexus* magazine and a Manual, available from *Nexus*, describing a motor devised by a New Zealander named Robert Adams. 'Over-Unity ' performance was claimed and enough was disclosed as a blueprint for replication of the machine. We did not really understand how it could operate quite as well as Adams had indicated, but we were convinced that 'over-unity' was in prospect. Accordingly, as it seemed easy to build a motor such as Adams described, our group settled for the recommendation that the Adams motor should be looked into and somehow constructed to verify its performance.

That was how I first came to know about the Adams motor.

Collaboration with Adams

At that time such experimental work that I had pursued on the ' free energy' theme was basically on solid-state magnetic systems and, in collaborating with a Scotsman, Scott Strachan, I had been involved with the invention of a thermoelectric device which was extremely efficient at converting low grade heat into electricity. Undoubtedly it defied the Second Law of Thermodynamics, but that point was not stressed in those early days. That invention had proved problematic because the devices built worked for a while by repeated operation for half an hour or so at a time, day after day, for several months, but then came the inevitable progressive weakening in conversion efficiency, ending with a defunct piece of equipment.

The story on that is told between pages 124 and 128 of Jeane Manning's excellent book *The Coming Energy Revolution - The Search for Free Energy*, ISBN 0-89529-713-2 published in 1996 by Avery Publishing Group, Garden City Park, New York.[Available from *Infinite Energy* also.—Ed.]

I was distracted from that thermoelectric venture when I took a more practical interest in the magnetic reluctance motor, inspired by what we had heard about Robert Adams. I was to be distracted again towards the end of 1995 when the Correa 'Abnormal Pulsed Glow Discharge' invention came to my attention, with its 5:1 over-unity feature clearly demonstrated. And now, as year-end 1996 approaches, I am destined to be distracted again, this time by having discovered myself why those thermoelectric devices mentioned above had failed. The remedy is easy as the problem does not involve deterioration. It is as if a bi-stable system has flipped to its off-state and just needs to be flipped back into its on-state, provided, that is, one knows what to flip!

Now, to come to the point about my collaboration with Robert Adams, I am writing these words on October 28th, 1996 and in a week from now the granted patent I have procured jointly with Robert Adams will become available from the British Patent Office in its issued form. It is Patent No. GB 2,282,708. I plan, in these pages, to introduce my own motor research and relate it to that patent and explain my connection with Adams.

I am also mindful that Adams, now recognized by an honorary doctorate from the Open International University of Sri Lanka, to become Dr. Robert George Adams, has recently published an addendum to the Adams Motor Manual entitled: 'The Revelation of the Century' and has included in that work some of my written contributions.

The immediate focus of my attention, however, is a rather critical letter communication authored by Michio Kaku and sent to a programme producer of a radio station based in New York. It was dated May 20th 1996, but it is only now that I have become aware of this communication from Robert Adams' new book.

Adams need not have included Kaku's letter in his book, but he did and I commend him for it. Apart from saying that Robert Adams was either the next Einstein and Newton rolled into one or a crackpot, he made these two comments:

"Apparently, he (Adams) wants to extract energy from the ether by using rotating magnets, thereby violating the first law of thermodynamics (conservation of mass and energy). This is an ancient idea, going back centuries and was most popular in the 1880s, but was disproved by the Michelson-Morley experiment and Einstein's relativity theory. Ether, which was supposed to be a magical substance which pervaded the universe, has never been measured in our laboratories."

"The proof is in the pudding. He (Adams) has to show a blueprint of his machines, show that they in fact generate energy, and show with a few equations how his theory works. Lacking a blueprint, a mathematical theory, and, say, video tapes of his motors generating energy from nothing, I cannot say with 100% certainty that he is wrong. (Only 99.99%)"

Now, having just had an 'over-unity' motor patent granted in which I share inventorship with Adams, I will assume that those Kaku remarks are addressed also in my direction and reply accordingly, point by point.

Firstly, as an educational exercise, the extraction of energy from the ether does not violate the first law of thermodynamics. By definition or simple semantics, if you extract energy from something and move it from that something A into something else B, the energy remains conserved overall. The first law of thermodynamics dates from before the time when the transmutation of mass and energy was recognized as the stellar power source by Sir James Jeans (1904). A critic might say, however, as Jeans himself did in his 1928 book 'EOS', that Isaac Newton knew of photosynthesis by which radiant energy transmitted through space is captured by plants and converted into matter, which stores energy by creating a combustible product. The transmutability of energy and mass was not discovered, nor was it first suggested, by Einstein. He was too late.

Secondly, the existence of the ether was not disproved by Einstein. Indeed, Einstein

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has not proved anything, nor has he disproved anything. One simply cannot flaunt Einstein's theory around as a reason for rejecting the prospect of an 'over-unity' motor. On the contrary, ask yourself why there are plans to test Einstein's theory at a cost of $500,000,000 dollars by launching Gravity Probe B in 1999. If Einstein's theory is right, why are there any doubts warranting expenditure on that scale?

Thirdly, Kaku says the ether has never been measured in our laboratories and that its existence was disproved by the Michelson-Morley Experiment. The fact is that Michelson did not perform the experiment to test or refute the existence of the ether. He lived another 44 years after performing that experiment and believed in the ether to his dying day. He was trying to sense the Earth's motion through the ether, but, since standing waves developed by mirror reflection had not been discovered when the experiment was planned, he had not allowed for that to affect the result observed. In fact, the ether energy stored in those standing waves, being trapped in the mirror system, makes the wave motion appear to be locked to the frame of reference of the mirrors, and not the ether as expected. The ether certainly was detected in the laboratory when Michelson found he could detect the Earth's rotation relative to that non-rotating ether by his light wave interference experiments jointly with Gale in 1925. It was detected some years before that by Sagnac in France and is detected in modern navigation technology by the ring laser gyro. How can the speed of a laser beam travelling around a closed path inside an optical instrument detect rotation of that instrument if the beam is not keeping a fixed speed relative to something inside that instrument that does not share its rotation? That something is the ether! No amount of book learning or mathematics can avoid that simple truth, and even though the word 'ether' is seen as something 'magical ' it is that something that delivers 'free energy', once we have decoded the combination of the magnetic lock which restrains its release. Note also that the ether reveals its existence when we have rotation and we have rotation in the Adams motor.

Fourthly, as to Kaku's pudding, which comes first, the chicken or the egg, the blueprint and the working machine, or the theory and the equations? Well, though we have no answer to this question of priority, we know there are chickens and we know there are eggs, so it really does not matter which comes first. Certainly, it seems, that in order for Kaku to decide whether ' free energy' is possible, albeit with only 0.01 % chance, there has to be a theory, a machine, and an ether.

It is for this very reason that I have made special effort during 1996 to publish my book *Aether Science Papers* as a forerunner of the *Energy Science Report* describing my own 'free energy' motor research. This Report No. 9 in the series is entitled 'Over-Unity Motor Design' and its date of publication is November 6, 1996, two days ahead of the first disclosure of details of my machine at a New Energy symposium held in Rotterdam in The Netherlands.

The formal electrical engineering theory explaining the motor operation in tapping 'free energy' is contained in a few pages in that Report. The motor design is described and a photograph of the machine is included. Moreover there is an outline 'blueprint' that indicates the design of the multi-megawatt versions of the machine. However, as to the ether, or 'aether', to use my normal terminology, describing that in full detail needs more than a few pages for scientific proof and, as Kaku well realises, the wisdom needed exceeds the talents of even an Einstein or a Newton.

About the Aether

I will digress here, just for a moment, before getting back to Robert Adams and the subject of the Adams-Aspden patent. My reason is another comment made by Kaku in that quoted communication. He asserted as a conclusion:

"Inventors want to solicit money from investors, so I have a moral obligation to say exactly what I think about issues that, at some point, may hurt people."

Now that is a very poor reason for attacking someone's lifelong efforts to probe the secrets of science with a view to advancing both knowledge and technology beneficial to mankind. The facts of life are that it is investors who want to solicit money by making profit from the creative endeavour of inventors. Invariably, inventors get hurt anyway, without some well-meaning individual doing his moral duty by hurting the inventor more by unwarranted criticism. Is it really a moral obligation to preach the gospel of Einstein's theory in contending that investors should steer clear of Robert Adams, when his only thought is to have his efforts recognized?

Of course, by the nature of things, the free-lance inventor can go adrift in a technical sense and then, if ensnared by those investors, he can be carried off into obscurity by a tidal wave of turmoil. Meanwhile the orthodox scientific establishment stands by and watches, mildly amused at the futile efforts of the free-lance inventor who ventures beyond the level of gimmicks for use in the household and garden. That is the way it is.

As to my book *Aether Science Papers* it shows how so much of vital importance, explained by neither Einstein's theory nor quantum theory, has a straightforward answer. You see, just as Robert Adams in New Zealand and I in England sit poles apart on this our Earth, yet we are governed by the same laws of physics and subject to the same constants of physics. Body Earth is our common rotating frame of reference, but body Earth does not explain why those physical constants are, so far we know, universal. We take that for granted, just as our forebears took for granted the fact that they all inhabited the same aether. Our modernist society and its Einstein enthusiasts tell us there is no aether and so, Robert, you are on your own and only God can tell you why your experiments would work as well in England as they do in New Zealand!

You might then wonder why scientists at the U.S. Bureau of Standards, at the National Physical Laboratory in England and at the equivalent CSIRO National Measurement Laboratory in Australia bother to measure the same physical constants to very high precision. Give or take a fraction of a part in a million attributable to experimental error, they always come out the same. Surely, that is because the aether spreads through all those locations and has the same structure everywhere. What do I mean by structure? Well, you need to look up the paper in *Physics Letters*, **41A**, 423424 (1972), entitled "Aether Theory and the Fine Structure Constant," to find the answer. That paper emerged from the Australian CSIRO laboratory just mentioned. It shows how α, the most basic dimensionless constant in quantum theory, is derived by aether theory to give:

$$\alpha^{-1} = 108\pi\sqrt{(2)}N^{-1/6}$$

and how N is found to have the lowest cell energy if N is 1843. This gives α^{-1} as 137.0359, correct to part per million precision in comparison with its measurement at any of those laboratories. If there were no aether then you might as well think of a number and try that, though it would be your ghost that makes that effort because you would no longer exist.

Of course, there will be the Kakus of this world who say that the above formula is mere number play, contrived to fit known results. Well, that may be true for Einstein's "1,2,3" theory, but it certainly is untrue for the aether theory. You see, all Einstein did by the disguised mathematics of his General Theory of Relativity was to say (1) that the spectral redshift was the same as that evident by use of Newtonian theory, given that energy gravitates, (2) that light beams grazing past stars are

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deflected by twice the amount expected from Newtonian theory and (3) that planets describe orbits around the sun as if the planet's motion-dependent attraction is three times stronger than the value predicted by classical theory. It is so easy to contrive a theory for a 2 and a 3 factor. A German schoolmaster Paul Gerber had, in 1898, 18 years ahead of Einstein, presented a theory for the '3' factor, based on the speed-of-light propagation of gravity across space, but that was not mentioned by Einstein. The factor of 3 arises because the energy transfer between sun and planet is not confined to a pencil thin line drawn between sun and planet, but rather fans out as it transfers to the aether field and then converges on its target after taking more time over the longer route.

Einstein's theory is sterile. It offers no physical insight into the truths of the role played by the aether. It cannot explain that 137.0359 that governs quantum theory and, even on its own territory, it cannot explain the dimensionless constant involving G, the constant of gravity, nor, indeed, can it explain the unifying link between electrodynamics and gravitation!

So, Robert out there in New Zealand, take note that you are in a part of the universe where the aether has the energy state corresponding to N having the value 1843 ! Note that I first discovered the formula above long ago in the 1950s using an engineer's slide rule, backed up by logarithmic tables for higher precision.

Take further note that, years after that 1972 paper was published, a famous astronomer in USA (Tifft), discovered that distant galaxies closely paired or in small groups exhibited differences in red shift. The differences were always multiples of 72.5 km/s in relation to the speed of light. Explaining this is a complete mystery. Why should Planck's radiation constant be different from one galaxy to the next? Well, if you, the reader, were to study my aether theory, you could work out that, since aether energy density throughout space has to be uniform on a universal scale, the spectral emission frequency of a radiating atom will vary in proportion to $N^{4/9}$. It varies as α^2 and also by a further cube root of this factor, which gives the power 4/9.

Now take 1843 as the base value of N and decrease it in steps as you look for higher energy per unit cell states in different galactic regions. You will find that the result is the 72.5 km/s observed by Tifft. Check that by calculating 4c/9N as N decreases from 1843 to 1828, c being the speed of light. Check the Tifft paper to verify what I say: W.G. Tifft, *Astronomical Journal*, **211**, 31-46 (1977). You will see his comment that he could find no evidence of gravitational interaction between those adjacent galaxies! So, what has happened to Einstein's theory. It requires universal gravitation with each of you being an individual observer at the centre of your own universe. I would rather believe in the aether, knowing that there is proof of its reality, and devote my efforts to tapping some of its store of energy to safeguard the future of mankind from unnecessary pollution.

The Adams Motor and the Adams-Aspden Patent

I have not built an Adams motor as described in his Manual. I do know that when I returned to Denver in May 1994 for the New Energy Symposium there were machines on show or described in the Proceedings which purported to be Adams motors, but they did not perform overunity. It was reported that one such machine came very close to being 100% efficient. Adams did not attend that meeting. However, in the intervening year I had struck up a contact with Adams. I found he was under the impression that such machines are unpatentable and I had skills in the patent field as well as knowledge about the physics governing the operation of motors and magnetism generally. In fact, I already had a granted US patent for a motor designed for overunity operation, but never built [US Patent 4,975,608]. Adams had possession of motors which he claimed had the over-unity performance. I had, at the Denver 1993 meeting, declared my belief that over-unity motors were possible and supported the plan to explore the Adams machine.

My distant association with Adams resulted in an exchange of technical information and the proposal to adapt the design of his motor in a novel way. His motor had open-ended magnetic stators and magnets in a single plane forming radial arms. The invention we jointly devised placed the magnets axially parallel with the rotor shaft, fitted two sets of toothed rotor pieces and made the stators into bridging yokes. The resulting configuration was of the form shown in Fig. 1, taken from the patent specification that we filed in U.K.

The machine has to work over-unity, if properly designed, because the magnetic flux switching assures that much of the flux across the pole gaps is diverted, as the poles separate, so that it still links the magnetizing windings but finds a return closure path sideways from the rotor pieces and so exerts no braking action on the motor. The magnets provide the drive torque pulling the poles into register when no current is applied to the windings. The input of current drives the flux from the stator bridging yokes and forces it into the lateral route as

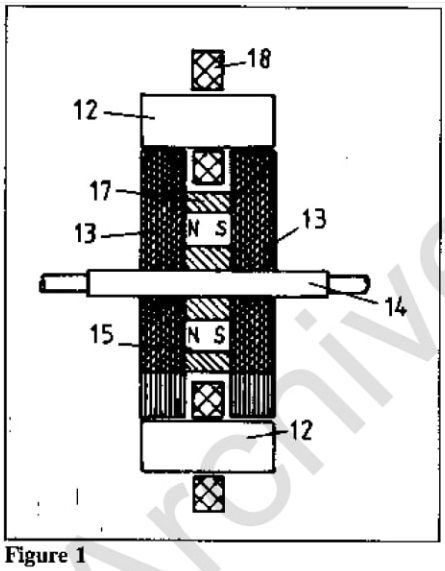

Figure 1

the poles separate.

There can be no input of inductive power by the magnetizing winding if there is no change of net flux linkage. It will change to some degree but, if the design were perfect, then the machine could run on negligible inductive power input. That leaves normal resistance loss and some magnetization loss, much of which can be reduced by making the machine larger and more powerful.

A small machine could prove the principle, especially if we allowed for the heat generated in the windings and explored the overall energy situation to see if we really are tapping energy from the aether.

The patent application was filed on 30th September 1993. It named myself and Adams as joint applicants and joint inventors. It has now been granted, as already stated. However, in May 1994, during the early days of its patent pendency, I encountered the reaction of those in Denver who had been unable to confirm 'over-unity' operability of the Adams motor. I saw our patent application as offering an improved design, but there were clouds developing and Adams was facing the problem of defending his position. As background also there was the rumour about rival Japanese motors and, as things developed, I heard of claims for a machine constructed in Hawaii [by Bertil Werjefelt.—Ed.] that indicated over-unity operation and could, for all I knew, be quite similar to the one covered by the Adams-Aspden patent application.

I was not too sure how Robert Adams was measuring his energy input and his energy output, so I could not vouch for his performance claims and, indeed, Robert was careful about the information he did disclose. When I heard he was adopting calorific measurement to verify the output energy, which would include heat generated in windings as well as magnetization

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loss, then I felt we were on track towards confirming the performance rating. I still wonder about the measurement of input power, having regard to the pulsed form of the current, and I am not reassured by the reference to the communication from the Group Research Centre of Joseph Lucas Ltd which Robert includes in his new book 'The Revelation of the Century.'

That said, however, going back to that 1994 period, I felt I had to take more initiative myself and so I decided to ask the U.K. Department of Trade and Industry to consider my application in a competition for an award of research funding based on a meritorious invention proposal. I offered something new, based on a new patent application, and backed by the patent cover I already had from my U.K. patent corresponding to the US patent already mentioned. In August 1994, though I was 66 years of age, I won that award and had 75% of research costs covered by the U.K. governrnent. In the event that funding carried my motor research through to year-end 1995.

I did not build the specific form of machine shown in Fig. 1, but instead constructed a motor that was designed to contain the magnetic flux more effectively within what became a single all-embracing magnetizing winding enclosing the whole motor. This is the basis of my own initiative on the 'over-unity ' machine and, as the U.K. patent specification on this new machine is to be published early in December 1996, I am now releasing information by publication on November 6th of my Energy Science Report No. 9 entitled 'Power from Magnetism: Over-Unity Motor Design.' Figure 12 of that Report, backed by design detail, shows how the over-unity factor is determined and I reproduce that figure below as Fig. 2.

Without going into full details, note that the diagram is an idealization of a B-H magnetization curve. It has a linear B-H relationship drawn through the origin O but at high flux density levels the curve bends over as it creeps towards saturation and the slope of the curve drops. The areas a, b, c and d, respectively, represent energy density input in energizing the magnetic system. The areas a and b apply for low flux range magnetization over the lower part of the curve. The areas c and d apply to flux changes confined to the upper region. Areas a and c are energy inputs from the magnetizing winding, whereas c and d are energy inputs that electrical engineers never consider, because that energy is supplied by the aether.

Where does the energy go? That is an interesting question fully explained in my Report, but the answer, simply, is that it is pooled by being shared equally between

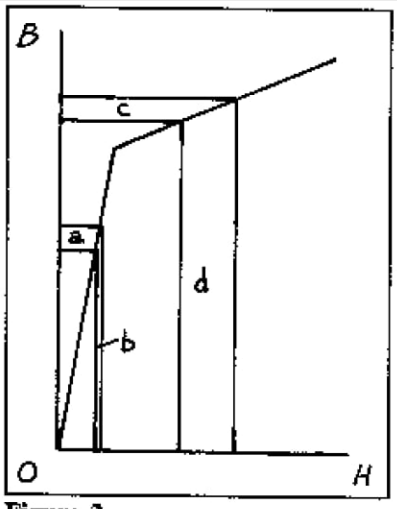

Figure 2

the space occupied by the ferromagnetic core and the space taken up by the air gaps in the core. That energy in the air gaps, or pole gaps in the motor, provides the mechanical drive.

So, you can see for yourself that, if you run the motor over the lower flux density range, which is normal, then you operate at an efficiency which cannot exceed (a+b)/2a, which is 100%. On the other hand, if the motor operates over the higher range, the efficiency can reach up to (c+d)/2c, which is very much higher than 100%!

Consider some realistic figures by putting the knee in the curve at 15,000 gauss and assuming that the incremental B/H ratio is 1000 over the lower range but only 50 over the upper range. Operate the stator core of the motor up to a B value of 20,000. H ranges from 15 to 115 over this upper range. Work out the area c as being (15+115)x5000/2 or 325,000 and the area d as being (15,000+20,000)xl00/2 or 1,750,000. You will then see that operation close to 319% efficiency is indicated!

Be less ambitious in power output terms and run the motor over an upper range between 15,000 and 17,000 gauss, to find that area c is (15+55)x2000/2 or 70,000 and the area d is (15,000+17,000)x40/2 which is 640,000. (c+d)/2c is then 507%!

If the aether delivers energy on loan to you and you use it to run the motor as the poles come together but refuse to give it back, then the aether has to replenish itself by taking power from its own vast pool of energy activity. It merely ripples to find a new level of equilibrium just as the sea will recover if you take a bucket of water from it. Eventually, that energy borrowed finds its way back to the aether as we spend it by generating heat radiation.

If you do not believe what I say, then wait and watch the progress as those who do believe, be it Robert Adams or whoever, so decides to build a magnetic reluctance motor heeding the design principles I have recorded in my Report.

As a final note I will echo one message which I have independently mentioned in my Report No. 7 (the Report used to brief the U.K. Department of Trade and Industry on my Award progress). It is that magnetic reluctance motors already being manufactured that are said to be 80% or 90% (or even 96% efficient as I now see reported on page 21 of the U.K. Institution of Mechanical Engineers 16 October 1996 issue of *Professional Engineering*) are already trespassing upon forbidden territory. That level of efficiency is either a false claim or the motors are already regenerating power from heat dissipated as loss.

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by Harold Aspden

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1-WS	DALE POND.....	WORKSHOP
2-WS	A. MICHROWSKI.....	WORKSHOP
3-WS	PAUL PANTONE.....	WORKSHOP - GEET DEVICE
4-WS	EUGENE MALLOVE	WORKSHOP - COLD FUSION / NEW ENERGY
5-WS	BRIAN O'LEARY	WORKSHOP
9-WS	DENNIS CRAVENS.....	WORKSHOP- PATTERSON CELL
11-WS	TOM VALONE.....	WORKSHOP

COLD FUSION TIMES

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Published Quarterly

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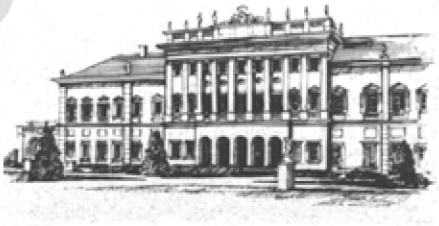

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EXPERIMENTER'S CORNER

A Simple Transmutation Experiment
by E. Mallove

Carbon Arc Experiments

The background for the suggested home laboratory element transmutation experiment with a carbon arc-in-air, are the two astonishing carbon arc-in-water experiments reported in *Fusion Technology*, Vol.26, November 1994 (pp.261, pp.266). Here are the abstracts of these two reports:

ANOMALOUS REACTIONS DURING ARCING BETWEEN CARBON RODS IN WATER

R. SUNDARESAN* and J. O'M. BOCKRIS
Texas A&M University, Department of Chemistry, College Station, Texas 77843

Spectroscopically pure carbon rods were subjected to a carbon arc in highly purified water. The arc current varied from 20 to 25 A and was passed intermittently for several hours. The original carbon contained ~2 parts per million (ppm) iron, and the detritus contained up to 286 ppm of iron. The carbon rods remained cool to the touch at >2 cm from their tips. Adsorption of iron from water or the surrounding atmosphere was established as not being the cause of the increase of iron. There is a weak correlation between the iron formed and the time of passage of current.

When dissolved O_2, was replaced by N_2 in the solution, no iron was formed. Hence, the mechanism

$$2_6C^{12} + 2_8O^{18} \rightarrow {}_{26}Fe^{56} + {}_2He^4$$

was suggested as the origin of the iron. The increase in temperature of the solution was consistent with expectation based on this reaction.

** On leave from Bhabha Atomic Research Center, Bombay, India*

. . . . . .

VERIFICATION OF THE GEORGE OSHAWA EXPERIMENT FOR ANOMALOUS PRODUCTION OF IRON FROM CARBON ARC IN WATER

M. SINGH, M. D. SAKSENA, V. S. DIXIT, and V. B. KARTHA
Bhabha Atomic Research Centre,
Spectroscopy Division
Trombay, Bombay-400085, India

A direct current arc was run between ultrapure graphite electrodes dipped in ultrapure water for 1 to 20 h. The graphite residue collected at the bottom of the water trough was analyzed for iron content by a conventional spectrographic method. It was found, in the first few experiments, that the iron content in the graphite residue was fairly high, depending on the duration of the arcing. The experiment was repeated initially six times, and the results showed large variations in iron content [50 to 2000 parts per million (ppm)] in the carbon residue. In the second series of experiments, which were done with the water trough fully covered, the amount of iron in the carbon residue decreased significantly (20 to 100 ppm). Here also there were large variations in the iron concentration in the residue, although the experiments were performed under identical conditions. Whether iron is really being synthesized through transmutation from carbon and oxygen as suggested by George Oshawa or is getting concentrated to different degrees through some other phenomenon is not currently clear. The iron in the carbon residue was also analyzed mass spectrometrically for the abundance of its various isotopes, and the results were more or less the same as that of natural iron. Besides iron, the presence of other elements like silicon, nickel, aluminum, and chromium was also determined in the carbon residue, and it was found that the variation of their concentrations followed the same pattern as that of iron.

– – – – – –

"George Oshawa's Transmutation Experiments" were published in the March 1965 *East-West Institute Magazine*.

Any suitably ambitious reader could try to repeat these carbon water arc experiments, and perhaps go further toward assuring that contamination was *not* the source of the appearance of the iron. It is my view that the iron appearing to have a natural isotopic abundance ratio is *not* convincing evidence that it is from contamination. Why? If transmutations occur this easily, then one could well imagine that lots of the iron ocurring in nature may have been "cooked" in this simple way—leading to those ratios.

Another embellishment would be to try the experiments with heavy water as well.

Now switching to an even simpler experiment, which we who attended ICCF6 last October heard about. These are carbon arc-in-air, allegedly producing iron—no water is used. Kenjin Sasaki, an agricultural consultant from Tokyo, handed out a protocol for doing these experiments, which I have transcribed below in "improved" English. He kindly lent me the color photographs of his tests, one of which appears on the cover of this issue.

Photo: K. Sasaki

Sasaki's Protocol:

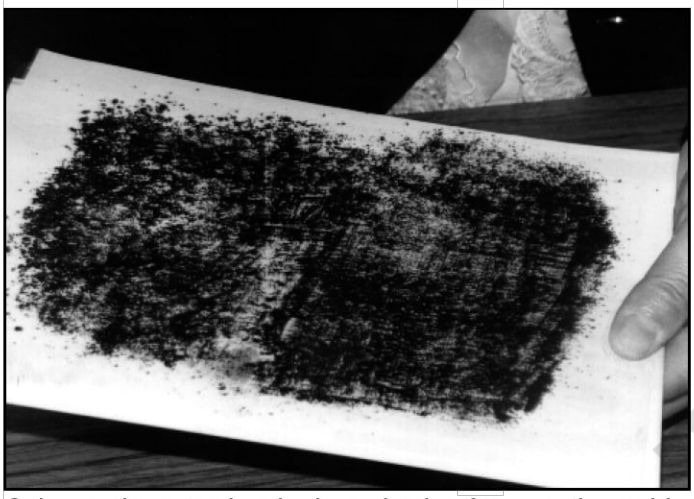
1. Ready for Job
2. Tools: Graphite crucible (four nines purity, i.e. 99.9995% pure or better)
Carbon rod
Copper plate (for cooling)
Tray for water cooling
Electric welder (100 V, 10 A)
or Auto Battery and clip leads
3. Materials Carbon powder (high purity)
Cooling water
4. Order of Experiment
A. Put 2 to 3 grams of carbon powder in graphite crucible.
B. Strike electric discharge arc with the electrode, about 1 minute, done about 3 to 4 times only (i.e. no more than four times) — [implies pausing between 1-minute arcs]
5. Inspection
A. Spread remaining carbon powder on paper.
B. Slide magnet under that paper. You can see locus of the magnet — it shows the iron bits [!!!! - *my comment, EFM*]
C. Take these [magnetically separated] materials and examine with a magnifying glass. You will find [among them] a brilliant alloy [!!!!, yes, see the photo of this alloy attached —here in black and white.]
6. Reappearance (reproducibility)
This experiment is very easy for young student, literary person, bank man, woman, etc.

New Energy Times Archive

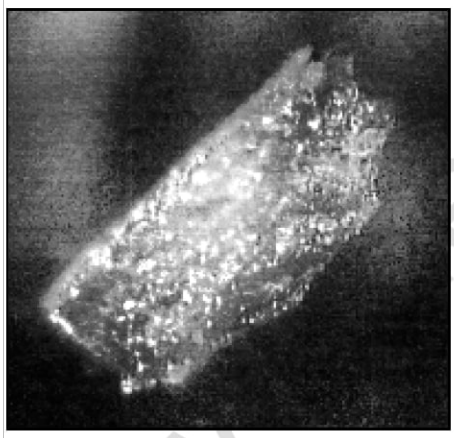
Kenjin Sasaki
942 Hikida, Akiruno-City
Tokyo 197, Japan
Phone: 81-425-59-5371
fax: 81-425-59-4927
****

I have been told by Christine Akbar in Boston (an MIT Physics Dept. graduate—now with the Kushi Foundation) that she has tried the experiment and it worked for her. She said it is important to keep the current between 8 and 10 amps. She used an automobile battery charger.

I do not think it is really necessary to have a static tray of cooling water under a graphite plate or crucible. I imagine that doing the experiment on a thick graphite plate would work as well.



Carbon powder, post-arcing, showing tracks where ferromagnetic material (iron?) has been pulled out. *Photo: K. Sasaki*



Microphotograph (approximately 100X) —"iron family metal from C+O with electrodischarge" *Photo: K. Sasaki*

Another description of the carbon arcs experiments is from:

The Philosopher's Stone: Michio Kushi's Guide to Alchemy, Transmutation, and the New Science, One Peaceful World Press, 1994. **[Available from One Peaceful World Press, PO Box 10, 308 Leland Rd., Becket, MA 01223]:**

"George Ohsawa and his associates in Japan succeeded in their experiments with several methods to produce Fe from C and O. Later French scientists tested similar methods and confirmed the success of the transmutation. After creating the method to achieve the most efficient possible transmutation, they filed patents accordingly. The following examples show only a few methods to accomplish the transmutation from C and O to Fe.

Method 1: Transmutation in Air (A):
Two graphite crucibles (approximately 2.5 x 5 to 6 inches) cover each other top and bottom. The upper crucible has a 10 mm hole, surrounded by a ceramic ring. The ceramic ring acts as an insulator. Into this hole, a carbon rod (0.25 inches in diameter) is inserted until it reaches to the carbon powder (2 to 3 grams) placed at the inside bottom of the lower crucible. The lower crucible has one or two small holes at the lower part of its side wall for air circulation. An iron base placed under the lower crucible acts as one electrode pole. The carbon rod acts as another electrode pole. As the carbon rod approaches the carbon powder, an electric arc arises. Continuing the operation for 20 to 30 minutes, the carbon powder changes to Fe.

In this experiment, the applied electricity is about 35 to 50 volts, and 8 to 18 amps, either A.C. or D.C.

Method 2: Transmutation in Water:
Using two carbon rods (0.25 inches in diameter), create an electric arc between them, by striking them on one another in water. This operation is performed for 1 to 5 seconds. Then, brown-black metallic powder falls down to the bottom of the water, which contains Fe.

The applied electricity is the same as in Method 1.

Method 3: Transmutation in Air (B.):
Carbon powder is placed on a copper plate, approximately 12 inches long, 6 inches wide, and 0.5 inches thick. This plate works as an electrical ground. A carbon rod (identical to the carbon rods used in Methods 1 and 2) used as another electrical pole, strikes repeatedly the carbon powder on the plate, producing an electric arc. The carbon powder changes into Fe.

The applied electricity is the same as in the above methods.

During the process of transmutation, Ni (nickel) is temporarily produced. But it disappears very soon, for it is an isotope with a radioactive nature. The life of an Ni isotope is considered approximately 1/lOOOth of a second.

In these experiments, the degree of transmutation from C and O to Fe is approximately 5 percent to 20 percent immediately, with a larger percentage of transmutation occurring gradually in the air, which has the effect of cooling the metallic powder to below room temperature. The Fe which is produced by this transmutation is stainless. It does not rust easily. It has also much less reaction to heat than ordinary iron, due to its composition of 2 Si (silicon) as the formula indicates. This iron was name G.O.S. (George Ohsawa Steel), given the initials of George Ohsawa by the scientists who worked with this transmutation.

All results of the transmutation of Fe have been carefully examined and analyzed by several methods including: magnetic inspection, spectroscopic analysis, chemical analysis, and examination by reagent, confirmed by authoritative testing agencies."

The various researchers who worked on the above (and the biological trasnsmutations also reported:)

- George Ohsawa-Philosopher, writer, honorary professor at Nippon University, honorary citizen of Paris, founder and president of Institut des Hautes Etudes Dialectiques et Scientifiques, Tokyo.
- Masashiro Torii-Doctor of chemistry, professor at Musashino Institute of Technology, Tokyo.
- Shizuko Washio-Doctor of biology, professor at Atomi University, Tokyo.
- Sanehide Komaki-Doctor of agriculture, professor at Mukogawa University, Kyoto.
- Chikao Narita-Doctor of medicine, president of Tokyo Shibaura Hospital, Tokyo.
- Yuzuru Sasaki-Research member of Institute des Hautes Etudes Dialectiques et Scientifiques, Tokyo.
- Noburu Yamamoto-Research member of Institut des Hautes Etudes Dialectiques et Scientifiques, Tokyo.

Not having tried this experiment ourselves—yet!—we do not know what to expect from it. We encourage our readers to try it and report their results to us. We will report on your findings in a subsequent issue. Those of you with access to quantitative scientific instrumentation for before/after element analysis are especially encouraged. Good luck!

(And, just for laughs, be sure when doing the experiment to wear a tall, pointed hat with stars on it!...EFMº

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Takahashi Scooter Update

Mark Goldes of Magnetic Power, Inc. (Sabastopol, CA) has informed *Infinite Energy* that initial tests of the Takahashi "supermotor"-equipped scooter (see *IE*#5&6) indicated no over-unity performance in a trial road test. The scooter, delivered to the US after numerous customs problems, failed to travel further than about 35 miles before it's batteries ran down. There were some reported problems with misplaced diodes, but Goldes felt that the unit that arrived did not meet original expectations.

So, the mystery continues: why a man of Takahashi's repute, capability, and age would be touting an over-unity motor if it were not so! We are disappointed, but will continue to watch this development.

Magnetic Supermotor/Generator in Arizona?

Galtech Semiconductor Materials Corporation of Mesa, Arizona is working on a magnetic motor and power source. *Infinite Energy* has contacted CEO Russ Chapman of Galtech, who confirms that the company has a working prototype of an ultra-performance motor and motor/generator.

Company engineer, David Porter, has been working on the devices for which patents have been sought—the applications are filed. A concept called "magnetic compression," is the basis for their technology. *Infinite Energy* has seen the Galtech device demonstrated in a video tape, but measurements supporting the claims for the motor/generator have not yet been provided. It is clear they are using sophisticated test equipment to monitor power, but whether this is being done correctly cannot be determined from the video.

Testing of the motor/generator early next year in a "dune buggy" is the short term goal, according to Russ Chapman. Though both Chapman and Porter are cautious in making statements about their technology, they seem convinced that they have seen output/input power ratios from 200% to 600%. Porter says the existing model of the motor will probably be able to achieve 20 horsepower.

A colorful corporate promotional sheet from Galtech contains the following text:

———————————————————

Energy Research Division

Providing a limitless source of low-cost energy for tomorrow

In a controlled laboratory test, the Permanent Magnet Brushless D.C. Motor/Generator technology delivers electrical power at new levels of performance not seen in today's motors and generators.

Galtech's Energy Research Division is developing a new concept in compact electrical power plants. The ultra-low-friction motor-generator uses a combination of mechanical and electromagnetic principles to create new levels of performance not seen in today's motors and generators.

How this new technology works

The design features a magnetically suspended, flywheel-like rotor that contains ultra-powerful, Neodymium permanent magnets. The flywheel rotates inside a series of coils placed in a circular pattern. The fields of these internal magnets interlock and rotate with the fields of magnets rotating on the exterior faces of the coils. This arrangement provides complete flux penetration of the coils, and levitation of the internal ring, which acts as a flywheel, storing energy. All moving parts ride on magnetic fields, creating a nearly frictionless condition. This results in a generator that produces impressive amounts of power output without the drag associated with iron coil designs.

Current Status

Patents have been applied for, and Galtech's management foresees many uses for this device. Testing of a prototype motor-generator continues to confirm design objectives, and the second phase of development is under way.

The future is virtually limitless

This technology could provide the ideal source of energy for electrically-powered vehicles that require optimum performance, extending the driving distance and reducing the number of batteries required.

Galtech Semiconductor Materials Corp.
45 West University Drive, Suite C
Mesa, Arizona 85201
Telephone: 602-835-5388
FAX 602-835-9424

Galtech Semiconductor Materials Corp. is traded on the OTC exchange Symbol: GTSM).

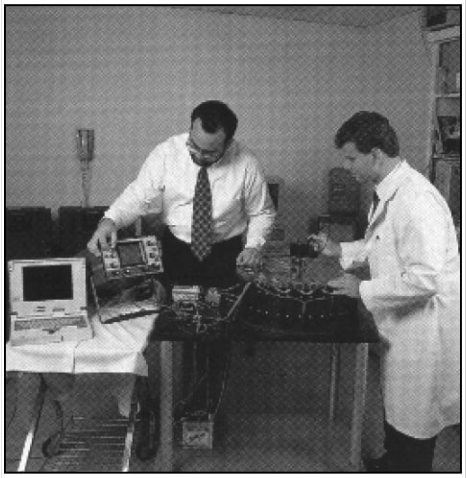
Galtech engineer David Porter had the following to say about their development plans: ***[He will be appearing on a video tape on Zero Point Energy that will soon be released by Lightworks Video—Call or write to Infinite Energy about details, you can get the tape from us—EFM]***

"At this time we reconfigured the magnets in the system to run it only as a motor. At this point we're working primarily on the motor system to get it to its most efficient position not only with controls but also with magnetic configuration. We have tried a number of different configurations in this system and we are now plotting those to see which is the best for the motor system. We are currently developing that motor system to place into an experimental automobile to run over various tests to see the efficiency of the motor as just a motor system. After we have the efficiency of that motor system put together, we will again begin on the generating system and developing that to its fullest potential.! And then down the road the goal of the project will be to combine the two systems again into a stand-alone system that can be used in either automotive applications or in power generation for homes or stand-alone systems....

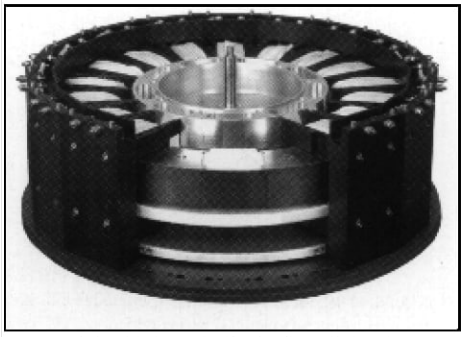
"In the system we develop, the stand-alone system, if we put that system in there then that system unless you drive a long way... basically should keep the battery packs charged until you have to replace the batteries. I think the batteries will wear out before the stand-alone system would!

That is the ultimate goal that we're working for. Right now, like I say, what we're working towards is just developing a highly efficient motor to drive a vehicle. Even without the added charging system on board we've developed, we feel it's so much more efficient than the systems that are out there now... Most electric vehicles run a maximum 100 miles on a charge...

"So what we're looking at is just as a motor alone with the added efficiency we have if we can take the average driving range of an automobile from 100 to 300-400 miles with the same charge, just because of the efficiency of the motor we're using then that's quite a leap forward....I think that's one of our first goals is to extend the range of the electric car. ..And that would be a big step forward into the acceptance of electric vehicles, I'd say then comes the generator system and ultimately the combination of the two."



David Porter (L) and colleague work or prototype motor. *Photo: Galtech*

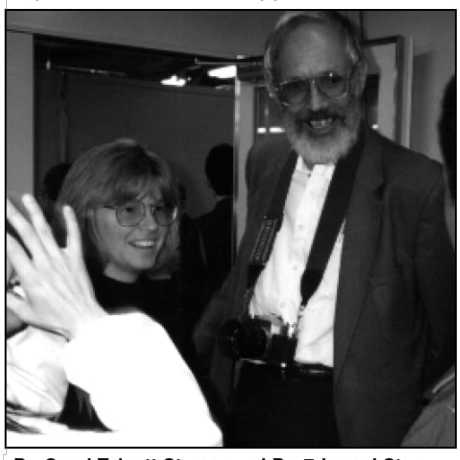


Cut-away view of Galtech prototype motor/generator. *Photo: Galtech*

New Energy Times Archive

Matrimonial Fusion (MF)

Though the "pathological skeptics" may doubt that there is *any* fusion going on in cold fusion, there can be no doubt that at least two instances of Matrimonial Fusion have occurred in the cold fusion field. The first such instance was detected at Los Alamos National Laboratory, where Dr. Edmund Storms and Dr. Carol Talcott joined forces and then got married—after working together on tritium detection. Here is the nuclear evidence: the lively, smart couple at the recent post-ICCF6 tour of Japan's NHE Lab in Sapporo:



Dr. Carol Talcott Storms and Dr. Edmund Storms
Photo: EFM

A more recent instance of MF happened only this year when cold fusion physicist Dr. Francesco Celani of Italy's INFN married Misa Nakamura, who formerly was working for Japan's Tanaka Precious Metals Co. The two newly-weds now live in Italy, where very hot cold fusion experiments are occurring in Dr. Celani's lab (see accounts of Celani's work in this issue of *IE*). Here is the precious, "glowing" couple: at the Apex Toya Hotel, site of ICCF6:

Dr. Francesco Celani and Misa Nakamura
Photo:EFM

The Prophetic New York Times

The November 5, 1996 *New York Times* "Science Times" may not have had any coverage of ICCF6 (The *NYT* has been blocking cold fusion completely since November 1992), but it did contain a prophetic few lines by journalist Malcolm W. Browne. The line appeared in his article about a Princeton University meeting of elite physicists, who were gathered "to consider prospects for the next 50 years," as one such meeting held 50 years earlier had done. Comparing today with 1946, Browne wrote (page C6):

"Today, nuclear physics has matured so completely that it is no longer interesting to many scientists and the subject was almost entirely omitted from last week's conference. <u>But the scientists agreed that the sessions probably had skipped some important but so far unrecognized fields of research."</u>

[Editor's underlining]

As we say, "out of the mouth of babes comes wisdom!" Browne also noted Nobel Laureate Philip W. Anderson's comment about 1946: "In 1946 work on the transistor was underway, John von Neumann was doing studies that led to the computer and many other things were happening that were never mentioned at that meeting."

Well, isn't that special! We've got just two words for Mr. Browne and Dr. Anderson: **WAKE UP!**

Schwinger's Ghost

Cold fusion theorist, Dr. Scott Chubb of the Naval Research Lab, slipped a letter into American Physical Society's *Physics Today* (Sept. 1996, p.15). The letter was bannered: *"More on Schwinger's Views on Cold Fusion."* In it he reminded *PT*: "...not only did Schwinger believe in the phenomenon of cold fusion, but he resigned from the American Physical Society in 1990 as a direct consequence of the manner in which an APS journal's editorial board had dealt with the subject."

Gus and Cold Tritium

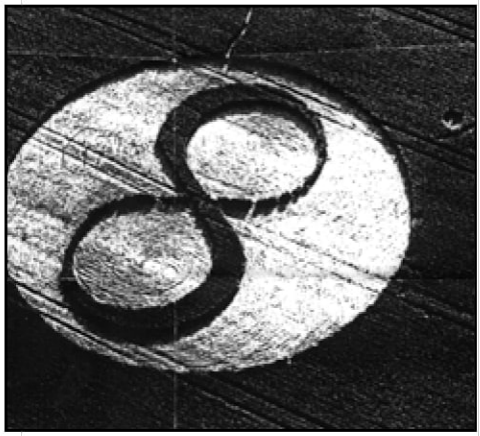
Science magazine, 25 October 1996 devoted a few pages to letters on how the United States should replenish the tritium in the now aging thermonuclear weapons arsenal (tritium has a half-life of only 12.5 years). Amid the various standard proposals, was one by former Chevron scientist Gustave K. Kohn. Gus (one of us!) referred explicitly to the glow discharge work of Claytor et al at Los Alamos National Laboratory, which produces tritium in "very small palladium wires"—the latter comment was as close to a direct mention of cold fusion that he could make.

Right on, Gus!

"Herbal Petrol" Likely Dead

The last issue of *Infinite Energy* reported on *Nature* magazine's significant, serious coverage of a person in India who had convinced many top Indian scientists that he could turn water into hydrocarbon fuel via a plant extract. Sad to say, the man was found to have cheated on at least one experiment that he did in public. Some 40cc of kerosene was seen oozing out of a small hole in Ramar Pillai's stirring rod. But the inventor was adamant that he was honest, stating: "I want an assurance from scientists that they will not reveal how I make herbal petrol, then I will reveal the process to them." Sigh! Unless he can really work a "miracle" now, his 15 minutes of fame have come and gone.

We Swear...
We <u>Did Not Do This</u>!



My friend, astronomer Dr. Gerald Hawkins (author of *Stonehenge Decoded*, sent me this photo of a rather appropriate recent crop circle that appeared in the UK! Have the "circle-makers," "hoaxers," or whoever—or *whatever*— makes these things taken an interest in *IE*? We doubt it, but you never can tell! Let's just chalk it up to a nice holiday gift.. **Happy New Year!**

Infinite Energy Archive

GAINING SOLAR ENERGY FROM ORDINARY WATER

Dr. Peter Graneau

Center for Electromagnetics Research
Northeastern University, Boston, MA 02115, U.S.A.

Presented at the WORLD RENEWABLE ENERGY CONGRESS IV
Denver, Colorado, June 15-21, 1996

ABSTRACT

This paper deals with the liberation of intermolecular bonding energy stored between H_20 molecules in liquid water at room temperature. This bonding energy derives from the thermal motion of vapor molecules in the atmosphere and is, therefore, largely solar energy. The conversion from kinetic (thermal) to potential (bonding) energy occurs in the process of condensation. Part of the bonding energy can be liberated with an electric arc current flowing through water. The current generates cold fog and mist droplets. Fractions of a gram of fine droplets created in microseconds have been found to explode violently. Pressure and kinetic energies freed by the explosion have been measured. Prospects are good for harnessing the internal water energy for electricity generation.

KEYWORDS: Water science; solar energy; water arc explosions; electrodynamic fog generation.

INTRODUCTION

Water is a liquid because the H_20 molecules attract each other. This attraction is the basis of liquid cohesion. The energy associated with the attracting molecules is potential energy. It was acquired from water vapor molecules when they first condensed to rain drops. The vapor molecule is stopped when it strikes the liquid surface of a drop. In the process the kinetic energy of the vapor molecule is converted to bonding energy in the drop. Vapor molecules are accelerated by atmospheric heat from solar radiation. In this way solar energy is concentrated and stored in ordinary water.

The attraction of the water molecules has to be balanced by equal and opposite forces of repulsion, otherwise the water substance would collapse, and water would not be water. If, for some reason, the forces of molecular attraction can suddenly be reduced, the remaining quantum mechanical repulsion will expand the water and cause a cold explosion. Precisely this phenomenon has been observed when an electric arc is struck in water and a current pulse is made to flow through the plasma. Liberated pressure and kinetic energies have been measured. Together with the low grade heat raised by current flow, it has been found that the total energy output far exceeds the capacitor energy used to strike the arc.

A unique feature of the cold explosion of water by an electric arc has been the conversion of about one-third of the water into fog and mist. Only the very smallest droplets of fog and mist have been found to explode. They are launched at high speed from the arc cavity into the atmosphere. There is no doubt that the production of the tiny water droplets is responsible for setting up repulsion forces between the droplets which cause the explosion. This is possible provided the molecular bonding energy, per unit mass, in the fog and mist is smaller than the bonding energy per unit mass of bulk water.

The occurrence of the explosions, which has found no other explanation, is the strongest evidence favoring the bonding energy difference. It requires the latent heat of evaporation—which is a measure of the bonding energy—of small droplets to be less than that of pools of water. Nobody appears to have measured the latent heat of fog. Hence it is quite possible that water plasma explosions derive their strengths from the reduction of molecular bonding energy which seems to occur when, without heating the liquid, water is transformed to fog.

Frungel discovered the unusual strength of water arc explosions (Frungel 1948). The phenomenon became the basis of a technology known as electrohydraulic metal forming (Gilchrist et al 1967). The explosion forces were measured at MIT (Graneau et al 1985). No explanation of water pressures in excess of 20,000 atm was found at the time (Azevedo et al 1986). Small quantities of water, launched from suitable accelerators, attained velocities as high as 1000 m/s, and were capable of punching holes through metal plates (Ruscak et al 1988). This gave rise to a search for a new electrodynamic force. The search was called off in 1994 when it was realized that the anomalously large forces were being generated by some form of chemical energy. At that time the experimentation with water arc accelerators was resumed by Hathaway Consulting Services (HCS), Toronto, Canada. The Canadian results were confirmed in the Department of Engineering Sciences of Oxford University, U.K., and in the TCBOR Laboratory of Richmond, VA, U.S.A.

HEAT AND STEAM ARE NOT THE CAUSE OF WATER ARC EXPLOSIONS

In most of the recent experiments performed at Toronto, Oxford, and Richmond, the energy delivered to the water accelerator from capacitors varied between 25 and 36 J. If all had been dissipated in the water it could not have increased the temperature by more than 6°C. Not even a hint of an explosion could be produced with this low grade heat. Steam propulsion was out of the question unless a significant fraction of the input energy could have been concentrated in a thin filament of the water.

No liquid breakdown mechanism is known which allows this concentration of heat in a sub-volume. Ionization is a very fast process which spreads throughout the high field region before the capacitor discharge current can begin to flow. Rather than generating heat, the ionization process stores electrostatic energy which is recovered as heat after the arc explosion when the ions recombine.

That ionization precedes the flow of discharge current was proved in the HCS Laboratory (Hathaway 1995) by recording the light output of the water plasma on the current oscillogram. It was demonstrated that the water started to emit light 0.8 μs before current flow. The light output was at its maximum when the capacitor begun to feed Joule heat into the water. This meant all the water throughout the explosion cavity was fully ionized before current flow which then could not have concentrated heat in a thin filament.

ANOMALOUS FORCES AND ENERGY

The explosions could have been driven by electrodynamic forces, arising in the water plasma, had these forces not been far too small. To appreciate the shortfall of electromagnetic forces to account for measured water pressures, take the general force law

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$$F=(\mu_o/4\pi)ki^2 \quad , \quad (1)$$

where i is the arc current and k a dimensionless factor depending on circuit geometry and the electromagnetic theory employed. Well documented are the field theory of Maxwell, Lorentz and Einstein and the Newtonian electrodynamics of Coulomb, Ampere, and Neumann (Graneau et al 1996). The Lorentz pinch force gave k=0.5, whereas measurements indicated k>5000. Ampere's force law resulted in 10<k<200 which was still far below observation. Apart from wide discrepancies in the dimensionless k-factor, the experiments also indicated that the explosion force F was not proportional to i^2. This left no doubt that there were anomalous forces at work.

The full theory of the plasma phenomena and the relevant experimental results are described in our new book on the *Newtonian Electrodynamics* (Graneau et al 1996). Ampere tension along current streamlines does play a part in water arc explosions in so far that this tension is responsible for subdividing the water into very small fog droplets. The Ampere forces are backed by sufficient energy to furnish the additional surface tension energy of the fog, but they are unable to muster the strong repulsions between droplets which cause the explosion.

Given the fact that thermodynamic and electrodynamic forces are orders of magnitude too small to bring about the arc explosions, we have to conclude that the experiments prove the existence of anomalous forces. Since every force in nature is backed by a store of energy, the anomalous forces require the involvement of anomalous energy.

RELEASE OF MOLECULAR BONDING ENERGY

Since the water does not boil, it is unlikely that it can be split into oxygen and hydrogen and release interatomic bonding energy. Discounting nuclear reactions, we are left with molecular bonding energy as the only reasonable source of the anomalous energy. Of course the fog explosions helped to reach this conclusion. Hull (1995) was first to provide video camera records which demonstrated the ejection of fog from the arc cavity. An example is Fig.I. This shows a supersonic shock cone of fog piercing the laboratory air. It was the result of discharging 144 J of energy into 1.5 cm^3 of distilled water. The fog plume contained about 0.5 g of water. The rest followed in the form of larger drops or stayed behind in the accelerator on account of droplet repulsion.

What could have caused the fog ejection? Vigier's theory of tight Bohr orbits may have a bearing on this question (Vigier 1993). According to this theory a difference in intermolecular bonding energy may arise between a pool of water and tiny fog droplets. The reason would be the formation of tight electron orbits in the droplets. These orbits represent a reduction in the stored bonding energy. Without reproducing the quantum mechanical analysis, Vigier's point is that the creation of lower energy states is due to the breakup of water into fog droplets. The quantum jump in bonding energy, from ordinary Bohr orbits to the tight version, then creates repulsion between droplets which manifests itself in an explosion.

Molecular bonding energy is closely associated with water structure. The water molecule is highly asymmetrical. The two small hydrogen atoms are not disposed on opposite sides of the large oxygen atom. This results in a strongly dipolar molecule. Hydrogen atoms on one molecule prefer bonds to hydrogen atoms on other molecules. Johnson's quantum mechanical calculations revealed long range H-H bonding between H_2O molecules (Johnson 1993). This may be curtailed in small fog droplets. It would lead to the same consequences as Vigier's theory.

Our understanding of the microscopic forces that define water structure remains incomplete (Postorino et al 1993). It is possible that the molecular bonding energy in small fog droplets is less than 540 cal/g, which is the latent heat of evaporation of bulk water and represents the maximum bonding energy per unit mass. Small clusters of matter often have very different structure than larger clumps of the same substance. Tile best known example is the C_{60} carbon molecule, known as the Buckminsterfullerine (Kroto 1993).

Efforts are under way to convert the water explosion energy to electricity. Electric power plants based on this working principle would not pollute the atmosphere nor contribute to global warming.

REFERENCES

Azevedo, R., P. Graneau, C. Millet, N. Graneau (1986), "Powerful water plasma explosions," *Physics Letters A*, **117**, p.101.

Frungel, F. (1948). "Zum mechanischen Wirkungsgrad von Flussigkeitsfunk-en,"*Optik*, 3, p. 125.

Gilchrist, I, B. Crossland (1967), "The forming of sheet metal using underwater electrical discharges," *IEE Conference Publication*, No.38, p.92.

Graneau, P., N. Graneau (1985) "Electrodynamic explosions in liquids," *Applied Physics Letters*, **46**, p.468.

Graneau, P., N. Graneau (1996). *Newtonian Electrodynamics*, World Scientific, London.

Hathaway, G. (1995). Private communication.

Hull, R. (1995). "Water arc explosions," *Electric Spacecraft Journal*, Issue 14.

Johnson, K.H. (1993) "Jahn-Teller symmetry breaking and hydrogen energy in γ-Pd D "Cold Fusion" as storage of the latent heat of water," *Proceedings of the 4th International Conference on Cold Fusion*, Maui, Hawaii.

Kroto, H. (1993). *The birth of C60 Buckminsterfullerines: Electronic properties of fullerines*, Springer, Berlin.

Postorino, P., R.H. Tromp, M.A. Ricci, A.K. Soper, G,W. Nelson (1993), "The interatomic structure of water at supercritical temperatures," *Nature*, 366, p.

Ruscal, L.J., D.W. Swallom, P.T. Pappas, P. Graneau (1988), "Electrodynamic water arc gun," *Proceedings of the 4th Symposium on Eelctromagentic Launch Technology*, University of Texas (Austin).

Vigier, J.-P. (1993). "New hydrogen (deuterium) Bohr orbits in quantum chemistry and 'Cold Fusion" processes," *Proceed-ings of the 4th International Conference on Cold Fusion*, Maui, Hawaii.

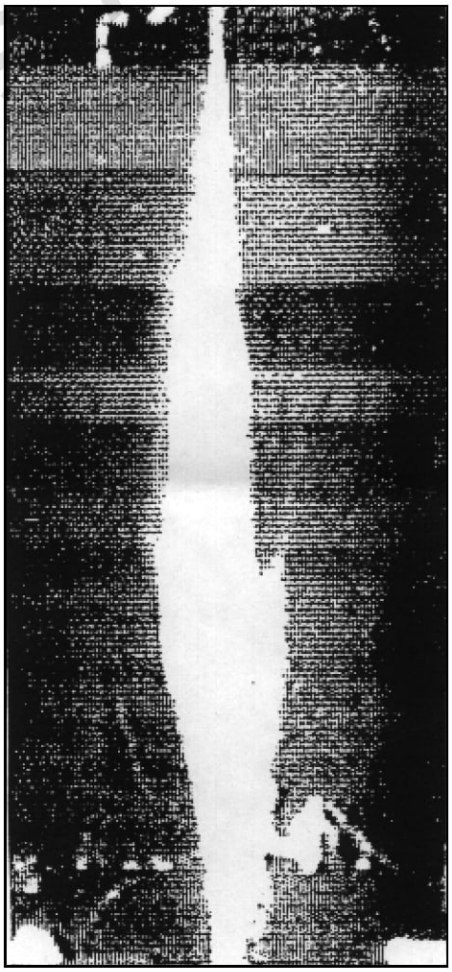

Fig.1 Two-meter tall fog plume with supersonic tip emerging from a 15 cm high water plasma accelerator.

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SPECULATIVE INTERPRETATION OF OVER UNITY EXPERIMENTS INVOLVING WATER ELECTROLYSIS

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The background to this paper is a number of papers reporting low temperature nuclear reactions outside the system Pd-D. These experiments (up to June, 1996) have been summarized in the review by Bockris, Lin, and Bush.[1]

A brief description of certain phenomena by Steri and Zorzi[2] is the earliest origin of suggestions made here. They sparked gasoline-air mixtures of unusual ratios, and recorded more heat being produced from such actions than could be justified in terms of thermochemistry. It was suggested that the origin of the heat arises from the natural deuterium within the gasoline and H present. Among possible reactions may be $D+D \rightarrow He^4$ or $D+H \rightarrow He^3$.

1. Experiments with Brown's Gas.

For some years, Y. Brown has been describing the special properties of "Brown's gas." At first, this gas was regarded merely as the result of the electrolysis of water. The only difference from this venerable process was that Brown mixed the hydrogen and oxygen together (i.e., in stoichiometric ratio) in plastic tubes and maintained them without contact with a metal so that when he introduced the mixture into the cylinder of an internal combustion engine, they burned hotter than the normal hydrogen-oxygen flame in air because of the volumetric ratio for optimal combination, and the absence of dilution with nitrogen.

However, as Brown's experiments have progressed (particularly those done at the Batou Institute in Peking), Brown has proposed the use of a number of novel solutions, some containing D_2O. In a communication of 1995 to the author,[3] Brown stated that the flame given by burning gases from the electrolysis of this mixture reached a temperature far above 2,000°K, easily melted tungsten, etc. The normal temperature of the H_2 - O_2 flame is about 2,000°K.

Brown stated[3] that tritium was found in the water collected from the combustion. This suggests a nuclear origin for the elevated temperature. No attempt to find He was made.

2. Stanley Meyer

Many patents have been received by S. Meyer.[4] He claims to be in possession of an above-unity process, but considerable doubt has been expressed about his work [See article in "Briefs" in this issue, "Stanley Meyer Unmasked?"—Ed.]. The Meyer process supposedly works by applying D.C. pulses (or some other waveform) to the stainless-steel electrode of a device aimed at decomposing water (with no ions added). The peaks of the voltage pulses may reach thousands of volts. The hydrogen produced in such processes was observed in one demonstration to be about six times that calculated by Faraday's laws —IF (a big IF) the current input was an assumed low value obtained by inference.

It is, however, impossible to know what this current really is because of the claimed pulse-like nature of the electrolysis and Meyer's refusal to let others measure current input with proper instruments.[5] (private communication by E. Mallove)

According to experiments described by Szklarczyk and Bockris[6] in 1987, when voltages of more than around 1,000 V are applied to an electrode in pure water, the electrode surface begins to glow and emits a white radiation. Dielectric breakdown of the water occurs and "streamers" pass between the cathode and the anode (such streamers have been shown to travel at up to c/10 and consist of an electron stream).[7]

Let it now be supposed as a hypothesis that the very high* local temperatures on the electrode surface triggers a nuclear reaction between naturally occurring deuterium atoms arising from the thermally caused dissociation of water, the heat arising from such a (possible) formation of helium could lead to a thermal dissociation of water in the vicinity of the electrode surface and thus, an excess of that formed by Faradaic electrolysis. Some recombination would occur but it may be incomplete at the (chemically) high temperatures involved.

Then, when the resulting H_2 is combined with oxygen (air) later, the heat evolved is greater than that expected from the recombination of hydrogen and oxygen calculated on the assumption that the H_2 arose in an amount calculated by Faraday's laws.

3. AquaFuel

A process was recently patented by Richardson[8] [And by others—see article in this issue of *IE* about other carbon arc-in-water work.—Ed.], which involves electrolysis between two carbon electrodes in tap or distilled water. The applied potential is, however, only several tens of volts. The carbon is used up forming largely CO but the hydrogen which is evolved is above that expected from Faraday's laws.

The speculation is that even under these lower voltage, high current conditons a nuclear reaction occurs between the naturally present deuterium to form helium and the heat of this reaction causes the dissociation of water which would give rise to the excess hydrogen.

4. Water Explosions Observed by Graneau and Graneau[9]

These workers have reported underwater explosions arising from apparatus in which two electrodes form an arc within water. (cf. Sundaresen and Bockris)[18] They have photographed a large area of plasma with the emission of a strong white radiation (cf. Szklarczyk and Bockris).[6]

One may refer here to observations published by Matsumoto[10] of cavities formed on the surface of electrodes undergoing electrolysis. Matsumoto claims these holes to be the sites of micro-nuclear explosions. A similar explanation has been given by R. George and R. Stringham[11] in interpreting the micro pits and damages they find in palladium electrodes after their sono-illumination. George and Stringham report that the edge of these craters are populated by new elements, i.e. that transmutation of Pd has occurred.

Thus, the carbon electrode surfaces which originate the arc which the Graneaus use is evidentally the site of micro explosions and a sufficient number of these provide sufficient heat to cause what is seen as an explosion in the water adjacent to the electrodes. Alternatively, the streamers (electron streams) which pass between the cathode and the anode during dielectric breakdown phenomena in water may give rise to nuclear actions according to schemes developed by Shoulders and Fox.[12]

5. Correas' Over Unity Discharge Tubes

The Correas have patented processes in which discharge currents pass between electrodes in gas discharge tubes as a result of a certain self-oscillating electrical pulse regime. An over-unity emission of electricity and heat is observed. The electrodes are partly used up. These experiments resemble experiments carried out in

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electrochemical cells, i.e. they consist of the "electrolysis" of gases. In so far as nuclear reactions have been observed to occur at some electrodes sparked in the presence of O_2,[14] it is reasonable to suggest they may occur here, too. However, insufficient information is available to allow a suggestion as to their identity.

Possible Eventual Development to Energy Sources

The suggestions given here are particularly speculative. They rest upon poorly defined facts and use an extremely novel theory not yet accepted by the nuclear community. (See, however, Kim and Zubarev[15]) However, the number of positive reports on the existence of low temperature nuclear reactions in solids is now too great for there to be doubt as to their existence. [17]

One can make a speculative suggestion of an application of eventual engineered versions of these devices. One begins with a trigger energy W and by this energy electrolyzes water under the over-unity circumstances corresponding to some of the above experiments. The W joules of energy entered into one of the electrolysis devices produces, say, 2W with respect to the energy equivalent of the hydrogen which they produce. (Calculated in terms of the normal chemical combination heat of the combustion of one mole of H_2 with 1/2 mole of O_2)

This hydrogen is then converted to electricity in a fuel cell and, after counting the losses (say 1/2 W), is used in an over unity electrolysis device to form, say, 3W of hydrogen energy.

The process continues by electrolysis and fuel cell and one can begin to remove some of the excess electricity to be applied to outside circuitry —eventually to act as an energy source.

These remarks may be applied to futuristic concepts of the organization of States in which the computer-directed and automated factory has reached an asymptotic state of development. Thus, within a few generations, perhaps no more than one, most of our means of production will have little need for the employment of people. The needed energy and goods could be available if there is sufficient "free" energy, applied to automated systems. A high degree of recycling would be necessary.**

Thus, Bockris and Dandipani[16] have shown that average personal income in countries is related to the average energy per person available by an ∫—shaped curve. 10kW averaged per person would bring an affluent (work-free) post-industrial society to the whole planet. (Though an end to population increase would have to be organized.)

* High in the chemical sense, but only around 0-1 % of the temperature range associated classically with fusion.

** Nevertheless, this can never be 100% efficient. However, in a few generations, extraterrestrial sources of materials will be available.

REFERENCES

1. J. O'M. Bockris, G. H. Lin and R. Bush, J. Sci. Exploration, 10, (1996), No. 2, p 1-4; J. O'M. Bockris, G. H. Lin and R. Bush, *J. New Energy*, 1, (1996), p.17.
2. D. Steri and P. Zorzi, *Foundations of Mathematics and Physics*, Ed. J. P. Wesley, Blumberg, 1990.
3. Yull Brown, private communication to John Bockris, 1995.
4. A. Griffin, Water as a Fuel, from *Impact of New Technologies on the Marine Industry, Southampton Institute*, Warsash, U.K., September 13-15, 1993.
5. E. Mallove, private communication to John Bockris, 1995.
6. M. Szklarczyk, R. Kainthla and J. O'M. Bockris, *J. Electrochem. Soc.*, 136, (1987), p.2512.
7. E. O. Foster, *I.E.E.E. Trans Electr. Insul. EI20*, (1985), p.905.
8. E. Mallove, *Infinite Energy*, 2, (1996), 44
9. P. Graneau and N. Graneau, *Newton v. Einstein*, Carlton Press, Inc., New York, 1993.
10. T. Matsumoto, Proceedings of the 5th International Conference of Cold Fusion, 5, (1995), p.583
11. R. George, *Infinite Energy*, 2, (1996), 17.
12. K. Shoulders, *Infinite Energy*, , (1996), 17.
13. P. and A. Correa, *Infinite Energy*, 2, (1996), p.18.
14. A. B. Karabut, Y. Kucherov and S. Savvatimova, *J. New Energy*, 1, (1996), 20
15. Y. E. Kim and A. L. Zubarev, *Nuovo Cimento*, 108A, (1995), p.1009.
16. J. O'M. Bockris and B. Dandepani, *J. Hydrogen Energy*, 12, (1987), 439
17. J. O'M. Bockris, G. H. Lin and R. Bush, *Infinite Energy*, (1996), p.17.
18. R. Sundaresen and J. O'M. Bockris, *J. Fusion Technology*, 26, (1994), pp.261-265.

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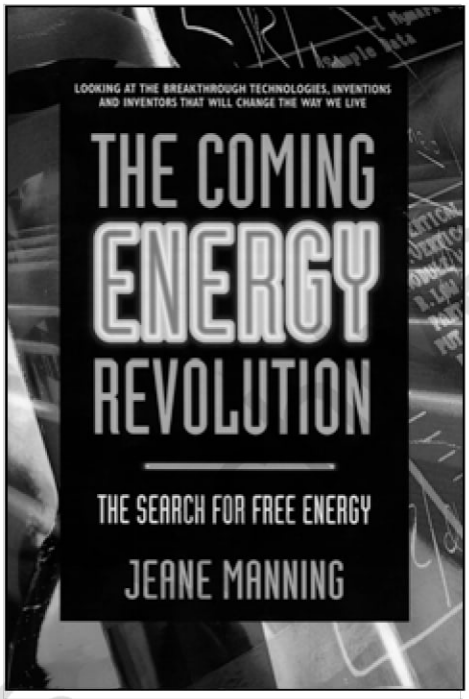

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NUCLEAR TRANSMUTATION IN BIOLOGY?

If "cold fusion" reactions occur in such simple ordinary water-metal systems, why not in living cells with their electrolytes, electric fields, and metal complexes? Indeed, others in the past have noted observations that would seem to imply element transmutation in higher organisms (*in chickens!*) and in plants. The French scientist, Louis Kervran did his own experiments with human subjects in which he found evidence for transmutation. He became convinced of the reality of biological transmutation, and documented his evidence and theories in his book, *Biological Transmutations (1962)*. H. Komaki in Japan published seminal work on element transmutations seen in bacterial cultures. Of course, this is all very odd and shocking to conventional ways of thinking, but the truth about Nature is all that matters. Hence, the publication of the following Russian paper, purporting to show a significant biological transmutation, is put forward for your consideration. We met Dr. Vysotski at ICCF6 in Japan who agreed to have his paper reprinted here. — *EFM*

EXPERIMENTAL DISCOVERY AND INVESTIGATION OF THE PHENOMENON OF NUCLEAR TRANSMUTATION OF ISOTOPES IN GROWING BIOLOGICAL CULTURES

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For the first time the experimental study of cold nuclear transmutation of isotopes was carried out in growing microbiological culture with controlled conditions of growth. With the help of Mossbauer effect the formation of Fe^{57} isotope from Mn^{55} in nutrient medium based on heavy water was observed. The possible mechanism of low—temperature nuclear transmutation is discussed.

1. INTRODUCTION

Hypothesis of possibility of nuclear transmutation of elements and isotopes in biological and geological structures has been repeatedly discussed during the last decades. The interest to this topic considerably increased after large—scale researches of the cold nuclear fusion phenomenon on the basis of dd-reactions in solids.

As far as we know, none of the previously conducted researches contains reliable data confirming the possibility of such transmutations.

We have carried out investigations aimed at discovery of nuclear transmutation of elements in microbiological cultures. We believe that this aim can be achieved only if an isotope obtained in the process of transmutation does not have any analogues in the nutrient medium where the culture is growing (along with inevitably present admixtures of this isotope). Therefore all experiments like [1] are hardly convincing because they don't meet this condition.

We have conducted a series of experiments based upon new technology employing the precise methods of Mossbauer spectroscopy. The experiments are based on the expected

$$Mn^{55} + d^2 = Fe^{57}$$

reactions in growing microbiological culture in heavy—hydrous (D_2O) sugar-salt nutrient medium deficient in Fe but additionally containing Mn. The reaction results in generation of stable rare Fe^{57} isotope, concentration of which in the natural iron (mainly Fe^{56}) is very low.

The Fe^{57} isotope obtained in small quantities can be easily discovered by means of the Mossbauer effect. The Mossbauer effect allows to monitor the isotope contents of all components of the nutrient medium, the initial culture and all samples of initial culture after its growth has finished, taking into account all varieties of experiments.

2. EXPERIMENTAL METHOD AND PROCEDURES

The researches were carried out on the basis of bacterial cultures *Deinococcus radiodurans M—1*, *Bacillus subtilis GSY 228*, *Escherichia coli K—1*, and yeast culture *Saccharomyces cerevisiae T—8*, selected according to the possibility of their growth in light and heavy water media. The course of the experiments was

TABLE

Components	Concentration in Medium (%)	Admixture of Fe (no more) relative (%)	absolute (g)
Sucrose	3	10^{-4}	$3\cdot10^{-7}$
$(NH_4)_2$ tartrate	1	$5\cdot10^{-4}$	$5\cdot10^{-7}$
$MgSO_4\cdot7H_2O$	0.25	$2\cdot10^{-4}$	$3\cdot10^{-8}$
$CaHPO_4\cdot7H_2O$	0.008	$1.5\cdot10^{-3}$	$1.2\cdot10^{-8}$
K_3PO_4	0.5	$5\cdot10^{-4}$	$2.5\cdot10^{-7}$
$MnSO_4\cdot7H_2O$	0.01	$5\cdot10^{-4}$	$5\cdot10^{-9}$
Pure Water (D_2O or H_2O)	100 (10 ml)	10^{-7}	10^{-8}

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as follows.

Previously obtained cultures after centrifuging, washing and post-growth were placed in a flask with sugar-salt nutrient medium containing salts of Mg, Ca, K, ammonium tartrate, sucrose and 10 ml of pure water (D_2O in transmutation experiments, H_2O in control experiments). The composition of medium is shown in the table.

In accordance with degree of purification of all nutrient medium ingredients (chemically pure category), the possible content of Fe as an admixture does not exceed $\Delta m \approx 1.1 \cdot 10^{-6}$ g. In accordance with natural content of Fe^{57} isotope (2.2 per cent of the total Fe), its possible quantity as an admixture does not exceed $\delta m \approx 2.5 \cdot 10^{-8}$ g.

In transmutation experiments, $MnSO_4$ containing less than $\Delta m_1 \approx 10^{-8}$ g of Fe admixture and $\Delta m_o \approx 2 \cdot 10^{-4}$ g of basis stable Mns5 isotope (No=1.8-101s of Mn^{55} atoms) was added to the sugar-salt nutrient medium.

All initial dry ingredients of the sugar-salt nutrient medium were investigated on Mossbauer spectrometer. The same investigation was held with a part of the inoculum in the nutrient medium of previously dried culture.

A typical series of experiments concerning nuclear transmutation of elements consisted in growing of certain microbiological culture in 3 disks simultaneously. The first disk contained full-compounded heavy-hydrous (D_2O) nutrient medium with $MnSO_4$, the second one—also heavy-hydrous (D_2O) nutrient medium without $MnSO_4$, and the third one — light-hydrous (H_2O) full-compounded (with $MnSO_4$) nutrient medium.

Such series of experiments was held for different cultures, different time of growth At (24, 48 and 72 hours) and different growth modes (in still disks and media and in suspension stirring mode using magnet stirring device). Bacteria and yeast were grown in a thermostat at 32°C.

After completing each series, the obtained biological substance was collected using a centrifuge, cleaned in distilled water (H_2O) and dried. The dried substance in the form of a thin film was separated using non-iron containing instrument, ground to a powder and placed in the Mossbauer spectrometer. To increase the possibility of resonant absorption in some of the experiments a sample was cooled to T = 78 K.

A Co^{57} isotope with activity of 40 mCu in a chromium matrix was used as a source of Mossbauer radiation. This source has a spectrum in the form of a single line of natural width. The measurements in each of 256 channels of spectrometer were carried out till the required number of counts $N_\infty = 3.5 \cdot 10^6$ was achieved in channels remote from gamma-resonance line. Calibration of gamma-spectrometer was carried out with standard Fe^{57}-containing absorber.

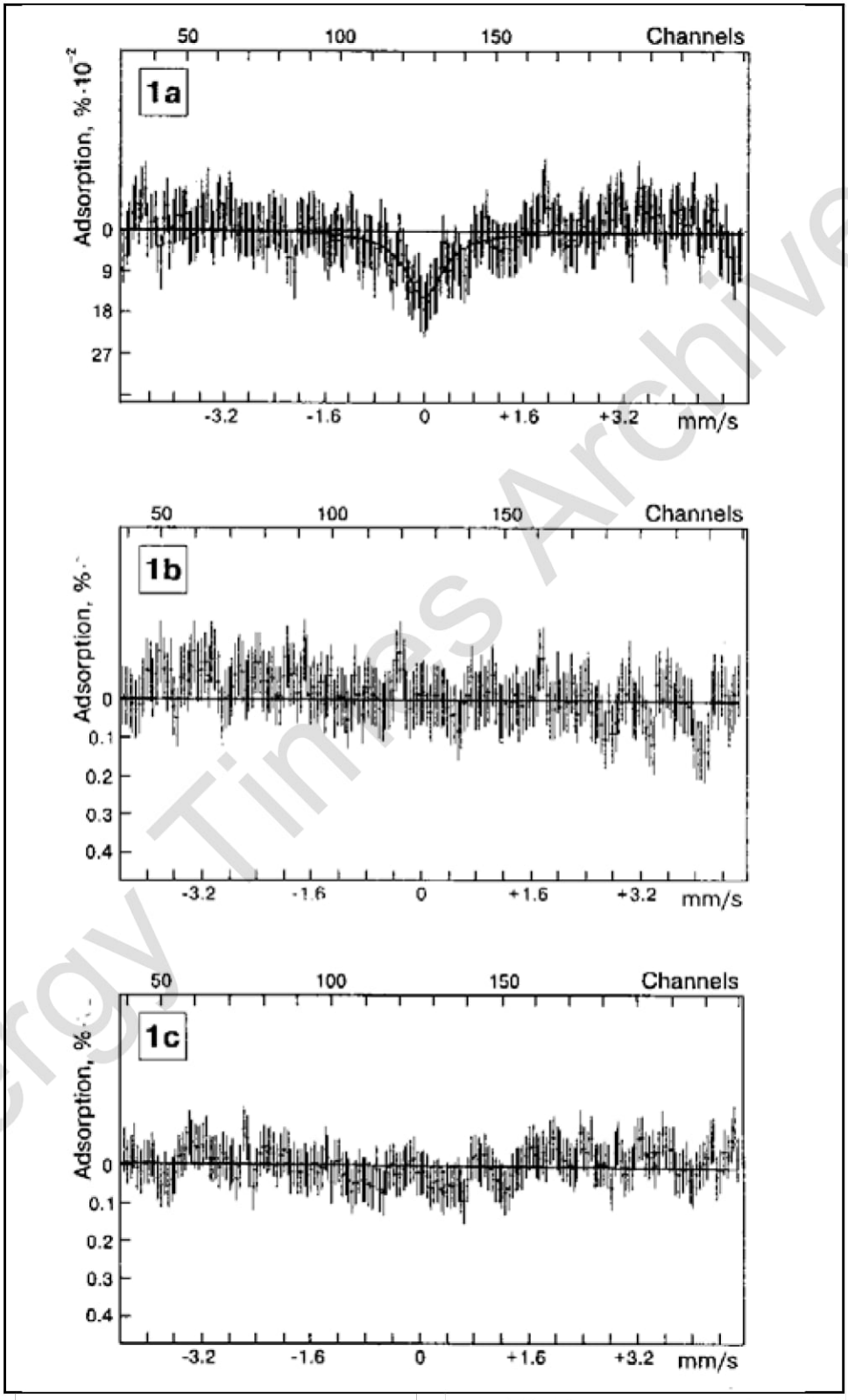

Figure 1. Mossbauer spectra of grown cultures. Culture *Saccharomyces cerevisiae T—8* grown:

a) in D_20 with present Mn^{55};

b) in H_20 with present Mn^{55};

c) in D_20 without Mn^{55};

d,e) Culture *Deinococcus radiodurans* grown in D_20 with present Mn^{55}.

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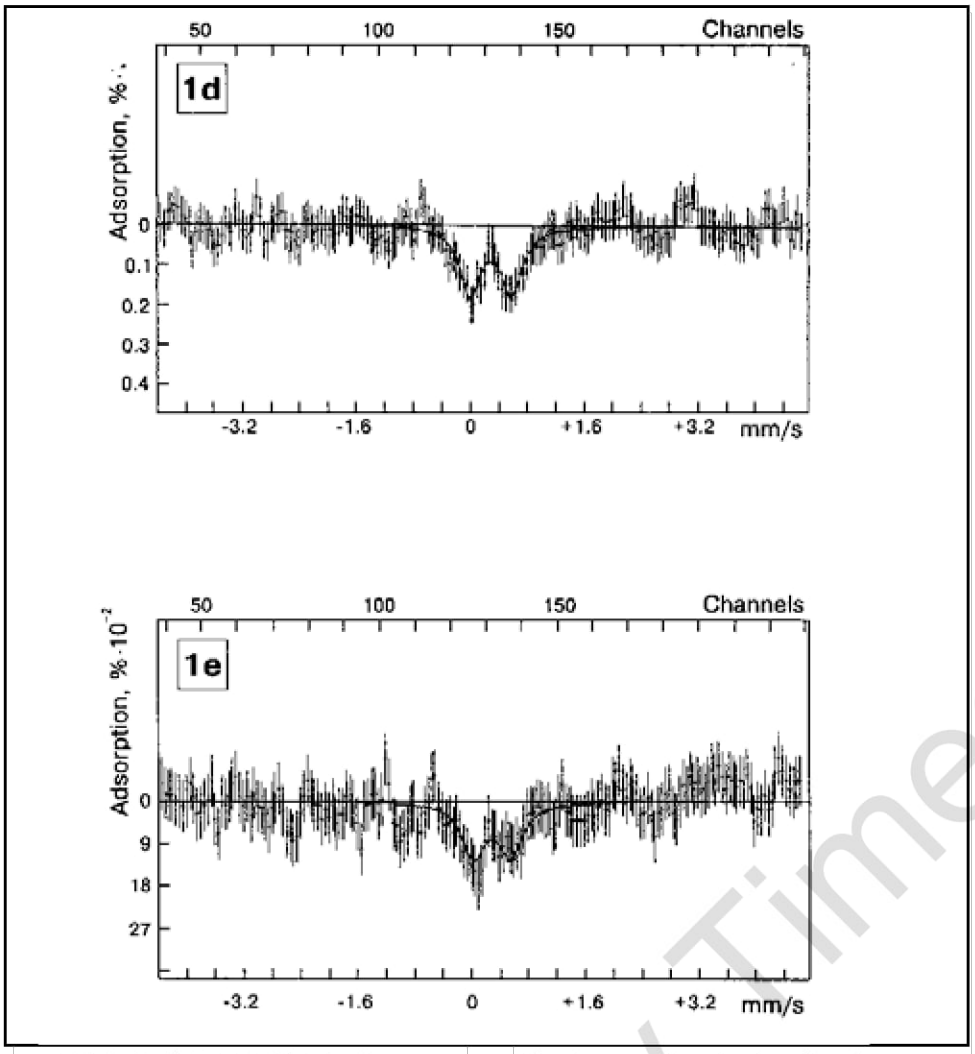

3. RESULTS AND DISCUSSION

The Figure 1a presents the Mossbauer spectrum of *Saccharomyces cerevisiae T—8* culture grown during $\Delta t = 72$ hours in nutrient medium of optimal composition, containing D_2O and $MnSO_4$. The total mass of the culture was 0.28 g. The spectrum 1b corresponds to the same culture grown in the medium containing H_2O and $MnSO_4$, and the spectrum 1c—the medium with D_2O, but without $MnSO_4$. The natural width of Fe^{57} Mossbauer resonance (in Doppler velocity units) equals $\Gamma = 0.19$ mm/s. In case 1a the gamma resonance line is widened by $p_a = \Delta\omega_a/\Gamma \approx 10$ times. The total number of resonant Fe^{57} atoms for a Lorenz-widened line was calculated by the equation

$$N \approx \eta S(1 + p)/\sigma_0 f,$$

obtained for a thin resonant absorber. Here $\eta = (N_\infty - N_0)/N_0$— relative depth of absorption resonance, N_∞ and N_0 — number of counts in non-resonant and central resonant channels, $S \approx 0.63$ cm^2 —area of gamma-spectrometer disk, filled with the studied culture, $f \approx 0.6$ — probability of Mossbauer effect in the absorber, σ_0 — crosssection of resonance absorbtion.

The full numbers of Fe^{57} atoms and their mass are the following:

$\eta_a = (1.9\pm0.53)\cdot10^{-3}$
$N_a = (0.87\pm0.24)\cdot10^{16}$
$m_a = (1\pm0.28)\ 10^{-6}$g.

The amount of Fe^{57} isotope in cultures grown in non-optimal conditions, with consideration of measurement, approximately corresponds to the concentration of Fe^{57} admixture in the nutrient medium and water. The significantly larger amount of Fe^{57} in the culture grown at optimal conditions, in the presence of D_2O and Mn^{55} is a result of low-temperature nuclear reaction of Mn^{55} transmutation into Fe^{57} taking place in this culture. The transmutation coefficient equals
$\lambda_a = N_a/N_0\Delta t = (1.9\pm0.52)\cdot10^{-8}$ Fe^{57} nuclei per s and per single Mn^{55} nucleus.

The similar results were obtained during the growing of other cultures in optimal conditions. In some cases (for example, for *Deinococcus radiodurans*) the structure of Mossbauer resonanse for created Fe^{57} in grown culture has a form of doublet, what corresponds to spatial or phase structure of the substance. Fig. 1d presents the result of investigation of Mossbauer spectrum of culture *Deinococcus radiodurans* in optimal medium (D_2O with $MnSO_4$). For this case

$$N \approx 2\eta S(1 + p)/\sigma_0 f,$$

and $p_d \approx 3.4$, $\eta_d \approx (1.53\pm0.57)\cdot10^{-3}$, $N_d \approx (0.59\pm0.21)\ 10^{16}$, $m_d \approx (0.67\pm0.24)\cdot10^{-6}$ g,

$\lambda_d = (1.3\pm0.46)\cdot10^{-8}$ s^{-1} per single Mn^{55} atom. It is necessary to point out that the average power

$$\langle P_{a,d}\rangle = N_{a,d}[M(Mn^{55}) + M(d^2) - M(Fe^{57})]\ c^2/\Delta t$$

that is produced in the process of reaction $Mn^{55}+d^2=Fe^{57}$ is small and doesn't exceed 50 mW per total volume V = 10 cm^3 of nutrient medium with growing culture (here $M(Mn^{55})$, $M(d^2)$, $M(Fe^{57})$—mass of nucleus Mn^{55}, d^2 and Fe^{57}).

As a result of connecting the main experiments 1a,1d and control experiments 1b, 1c (nonoptimal nutrient medium ingradients on the basis of H_2O with $MnSO_4$ and on the basis of D_2O without $MnSO_4$) one can say:

1) in D_2O there isn't admixture Fe^{57};
2) in sugar-salt components of nutrient medium there is no Fe^{57};
3) during the growing of culture Fe^{57} isn't extrated from the glass of flask.

One of the theoretically possible effects causing the appearance of absorption peak in cultures grown in the medium with D_2O and $MnSO_4$ (and absence of this peak in control experiments), could be connected with possible splitting of Mossbauer line due to Fe^{57} admixtures in experiments 1b (H_2O with $MnSO_4$) and 1c (D_2O without $MnSO_4$) and localization (narrowing) of this line (with its increasing) in the main experiments 1a, 1d (D_2O with $MnSO_4$). To ensure that such effect doesn't take place the additional control experiments were performed, when small amounts of Fe^{57} were added to media 1b and 1c. These experiments have shown that the appearing resonances of absorption by their width and energy approximately correspond to the case 1a. Therefore the appearance of absorption resonance on Fe^{57} in main experiments is not connected with elimination (transformation) of hyperflne splitting and redistribution of resonance line positions, but manifests the appearance of Fe^{57}, which is

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absent in the control experiments.

Concluding the mentioned results and discussion of the experiments, we can state, that creation of Fe^{57} isotope as a result of nuclear transmutation in growing biological medium was observed and verified using precise Mossbauer spectroscopy methods.

4. THEORETICAL MODEL

In conclusion let's consider briefly the possible mechanisms of nuclei interaction, contributing to effective nuclear transmutation reaction with formation of Fe^{57} isotope.

Obviously, no modification of micro-accelerating mechanisms connected with formation of microcrack, accelerating plasma waves and similar processes can take place in a liquid nutrient medium. It is also evident that tunneling quantum processes can't provide a great probability of nuclear transmutation. We assume that the most effective action in this case would be the one provided by the mechanism suggested in [2] (and in [3]), which is capable of providing a short-term elimination of the Coulomb barrier of the pair reaction in micro-potential hole with the structure that is close to parabolic. In such holes the structure of quantum levels is equidistant and characterized by the spectrum

$$E_n = h\omega(n+3/2),\ n = 0, 1, 2, ...$$

Let the Mn atom be in the center of such a hole. Due to dissociation processes, high-hydrous compound has a great quantity of free d— deuterons (at T = 300 K dissociation probability is $\xi \approx 1O^{-10}$). When a deuteron gets into the hole due to diffusion, a complex Mn+d appears in the hole. In the free space this complex would correspond to quasimolecule $(MnD)^+$. In the quantum system the situation is more complicated.

The matter is that in such a system energy of nucleus interaction V(r) is a sign-variable distance function. For distances $r \geq a \equiv h^2/me^2$ this energy V(r) like the energy of p-e-d system and V<0. In the region of intermediate distances $a/Z < r < a$ this energy is defined by the Thomas-Fermi approximation

$$V(r) = \{Ze^2/r\}\chi(rZ^{1/3}/0.885a),\ \text{and}\ V(r) > 0.$$

In the region of small distances $r < a/Z$ nucleus interaction corresponds to pure Coulomb repulsion of bare nuclei and $V(r) = Ze^2/r > 0$.

Can this energy be a small amendment and not influence the character of nuclei movement in quantum system? For that purpose, the diagonal elements of interaction energy matrix should be small and probability of interlayer transition because of this interaction should also be small. Probability of interlayer transition in the regarded parabolic potential becomes equal to zero automatically at the moment $\tau = 2s\pi/\omega_0$, s = 1, 2, 3 K, when frequencies of all possible interlayer transitions ($\omega_{rk} = (n - k)\omega_0$ will correspond to zeroes of spectral density of perturbation energy

$$|V(\omega)|^2 = |\int_0^t V_{nk}(t)\exp(i\omega t)dt|^2$$

$$= |V_{nk}|^2 [\sin(i\omega t/2)/(\omega/2)]^2.$$

Here nucleus interaction completely disappears and deuteron wave function is determined only by quantum potential field properties.

For zeroing of diagonal matrix elements of interaction energy (which is a sign-variable function of inter-nucleus distance)

$$V_{nn} = \int 4\pi\ |\Psi_n(r)|^2\ V(r)\ r^2\ dr.$$

it is essential that the size of the hole be optimal. In the paper [2] it is shown that in case of d-e-d system this size corresponds to 2R ≈ 3Å and the optimal slope of the walls of the hole is $U_{max}/R^2 \approx 0.1$ eVÅ^2. For the system Mn-d this size is 2R ≈ 8Å.

If all the above-mentioned conditions are met, the independent from Mn quantizing of the deuteron in the hole takes place. In this case the wave function of deuteron $\Psi_n(0)$ in all even states will be different from zero in the centre of the hole, where the Mn nucleus is located. This leads to a high probability of nuclear fusion

$$\lambda = C|\Psi_n(r)|^2,$$

C—constant of purely nuclear Mn^{55}-d^2 interaction.

As it can be seen from the given scenario of the process, quantizing stuctures of optimal size and shape are necessary for such non-barrier nucleus interaction. The exact parameters of these structures are very hard to calculate. The situation substantially improves when the hole parameters are slowly changing inevitably passing through optimal value. This situation is realized in growing microbiological cultures. In the growth process the replication of DNA and other biomolecules takes place. In this case in the field of growth interatomic potential holes with slowly changing sizes are consistently appearing. If a Mn atom and a deuteron are in such a changing hole, conditions for a new Fe^{57} isotope fusion will be created.

We believe that the given mechanism completely describes the basic properties of the process of nuclear transmutation, which is observed in experimental course.

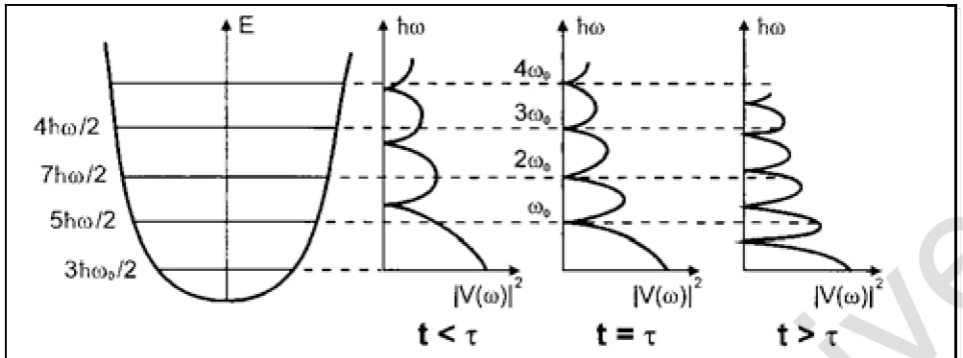

Рис. 3. Соотношение между спектром квантовых уровней энергии E_n в параболической потенциальной яме и спектральной плотностью $|V(\omega)|^2$ энергии возмущения V(t) для $t < \tau$, $t = \tau$, $t > \tau$.

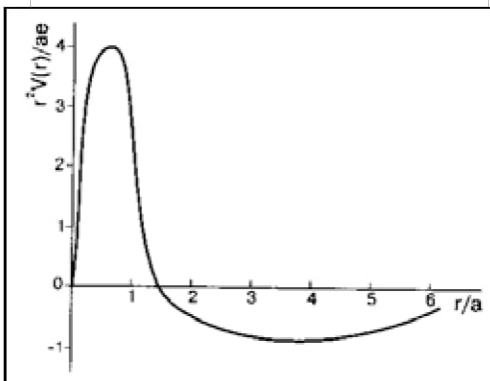

Рис. 2. Пространственная структура энергии взаимодействия $r^2V(r)$ в системе Mn—d.

REFERENCES

1. H. Komaki, "Observations on the Biological Cold Fusion or the Biological Transmutation of Elements," in *Frontiers of Cold Fusion (Proc. Third International Conference on Cold Fusion)*, (Nagoya, October 1992), Ed. H. Ikegami (Universal Academy Press, 1993), p. 555.

2. V.I.Vysotskii. "Conditions and Mechan-ism of Nonbarrier Double-Particle Fusion in Potential Pit in Crystal," in *Proc. Fourth International Conference on Cold Fusion* (Lahaina, Hawaii, December 1993), Ed. T.O. Passell (EPRI, 1994), Vol. 4, p. 20-1.

3. V.I. Vysotskii, R.N.Kuz'min. Intern. Symposium *Cold Fusion and Advanced Energy Sources* (Minsk, 1994), Ed.Hal Fox, 1994, p. 288-295.

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THE GOLDSMID-GRIGOROV ACCOMPLISHMENT: A MAJOR BREAKTHROUGH IN THERMOELECTRICS

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This article deals with both thermoelectricity and superconductivity. It has been written partly in response to a report by Dr. Paul C.W. Chu (1). He reported on the ceramic-like superconductor, also known as superconducting cuprate, comprising lanthanum barium copper oxide. The latter was developed in the late 1980s by K. Alexander Muller and J. Georg Bednorz, of the IBM Research Laboratory in Zurich, Switzerland, which demonstrated superconducting properties at 35 K. Shortly thereafter, in early 1987, Dr. Chu, along with Maw-Kuen Wu, and their co-workers, discovered superconduc-tivity at 93 K, in yttrium barium copper oxide, or YBCO, for short. Thus, YBCO would become superconducting in a bath of liquid nitrogen.

Dr. Chu reports further on a confirmed critical superconducting temperature of 134 K, first observed in 1993, under normal conditions, by A. Schilling et al, at the Swiss Federal Institute of Technology, in Zurich, in another ceramic-like cuprate, namely mercury barium calcium copper oxide. He further states that he, along with Dave Mao and their co-workers, by squeezing the aforementioned compound were finally able to raise the critical superconducting temperature to 164 K. Dr. Chu, furthermore, states that a room-temperature superconductor can be found, since most theories do not exclude such a possibility. He concludes, by stating that a room-temperature superconductor, if eventually discovered, would surely initiate another industrial revolution.

If I were in Dr. Chu's place, I would, certainly, refrain from using the term "industrial revolution" to qualify any new technological development, no matter how significant. Such a qualification has traditionally been meant to refer to the invention and development of the reciprocating condensing steam engine, by the Scottish engineer, James Watt, in Glasgow, more than two hundred years ago. Implicitly, or explicitly, the term "industrial revolution" is also used as an eternal honor, and tribute to the greatest technological accomplishment of Western Civilization and of all times, for that matter—the invention of the reciprocating, condensing steam engine. Behind that engine forever stands the towering, greater-than-life figure of James Watt.

James Watt, through his invention of the steam engine, ended human dependency on work animals, such as horses, mules, and oxen. He thus created the modern industrial, technological and scientific era, we now live in. As a consequence, Mankind's life was enormously changed, and would never be the same again. The process has been irreversible, and of historic proportions. It is the *one* invention that has had the most impact on human existence. That is why there will never be another industrial revolution. The invention of the steam engine has been like an unstoppable creative force, through which everything else in modern science and technology thereafter originated.

James Watt started from scratch, and accomplished the impossible, the first working model of an almost perfect steam engine. Moreover, the discovery of the First, Second and Third laws of Thermodynamics, as well as the concept of entropy, or the principle of irreversibility in nature, are all direct consequences of the steam engine. The entire history of mankind can be, appropriately, divided into two, entirely different, periods: the era *before* James Watt, when human existence was very much the same, with little, or no noticeable, change, from year to year, from century to century and from millennium to millennium, and the era *after* James Watt, when the rate of scientific and technological progress is so enormous and unstoppable that it keeps growing by an ever increasing exponential factor.

There is no such thing as a repetition, or renewal, of the historical cycle. In the words of the late Professor Joseph H. Keenan, of the Massachusetts Institute of Technology, human history is composed of a series of irreversible processes. The invention of the steam engine, by James Watt was one of them. Consequently, there will never be another industrial revolution.

As the popular saying goes, "The empty cans make the loudest noise." I am referring to proponents of superconductivity, who are already claiming that a room-temperature superconductor would surely initiate another industrial revolution. Superconductivity is not an energy conversion technology. It is, at best, only a supporting technology, whose main function is to substantially reduce, or totally eliminate, the I^2R losses when an electric current flows through any conductor, cable, or any component of an electrical machine. This is the basis of all future, applications of superconductivity. That is all there is to it. In order for superconductivity to exist and be useful, it needs a supply of electrical energy. Such a supply must come from an energy conversion device, which can be any of the conventional engines, such as a steam engine, an internal combustion engine, a gas turbine, or a hydraulic turbine. Should a real breakthrough, in thermoelectrics, occur in the immediate, or near, future— which, I am convinced, is bound to happen and is probably imminent— then all of these conventional prime movers will eventually be replaced by thermoelectric energy conversion devices or thermoelectric power generators.

Should a breakthrough in thermoelectrics eventually occur, it is only we in thermoelectrics who would have every right to call it "a new technological revolution." The steam engine and a thermoelectric power generator have one thing in common: they are both energy conversion devices, whereas superconductivity is definitely not.

Should there be a breakthrough in thermoelectric energy conversion, it will outdo superconductivity in both technological significance, as well as market volume worldwide, by several orders of magnitude. Regardless of all the hype and fallacies of the superconductivity proponents the real technological revolution will occur here, in thermoelectrics, which very appropriately may be called: "a new technological revolution."

The new developments in superconductivity, as reported by Dr. Chu in *Scientific American*, are largely based on the discovery of various ceramic-like substances known as cuprates. What Dr.Chu and virtually the entire scientific and engineering community do not know is that the room-temperature superconductor has already become a reality! Thus, the breakthrough, envisioned by Dr. Chu, is already a fact. It represents the wave of the future for both superconductivity and thermoelectricity.

How can this be? Around the time Dr. Chu's article was published, I came across a research report(2) which described an experiment, conducted by Dr. Leonid N. Grigorov, a polymer physicist in Moscow. The report was brought to my attention by my contacts at Magnetic Power, Inc. of

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Sebastopol, California, with which I was affiliated as a scientific consultant. I was responsible for the area of thermoelectrics. I was asked to thoroughly review and evaluate it for its potential technological applications. Dr. Grigorov's experiment was carried out on a thermoelectric refrigerator, in which the n-type branch was made of bismuth telluride, while the p-type branch was replaced by a passive branch. The latter was essentially comprised of a high electrical conductivity, and negligible thermal conductivity, oxidized polypropylene polymer film (OPP) that was discovered by Dr. Grigorov and colleagues in 1985.

Dr. Grigorov appears to have conducted a very good experimental investigation, with the main objective of studying the possible use of polymer superconducting films as a substitute for the p-type branch of a bismuth telluride thermoelectric refrigerator. However, the concept of using a passive thermoelement, as a replacement for badly-performing p-type legs in thermoelectric energy conversion devices, originated with H. Julian Goldsmid et al., in 1988(3).

Dr. Goldsmid proved that there is some merit in using a material with a very low Seebeck coefficient, but with a very high ratio of electrical conductivity to thermal conductivity, as the positive branch. Dr. Goldsmid argued that the figure of merit, Z, for a thermocouple, in which the material is used as one branch, will be almost equal to the value of the figure of merit, Z, for the semiconducting branch. In other words, although this hypothetical substance is contributing nothing to the Seebeck or Peltier Effect, neither is it detracting from the performance of the semiconductor. Therefore, we may call it a passive thermo-element. A superconductor is known to have a thermoelectric power equal to zero, i.e. it contributes nothing to the Seebeck coefficient, a ratio of thermal conductivity to electrical conductivity, k_p/σ_p, essentially equal to zero, due to the infinite, or very high, electrical conductivity, and finite, or very small, thermal conductivity, dominated by phonons.

Thus, the superconductor does not detract from the (high) performance of the n-type branch. The superconductor, thus, serves as a passive thermoelectric branch, or passive thermoelement. Dr. Goldsmid took the further step of proposing the use of new, high critical temperature superconductors for this purpose. He conducted an experiment on a thermocouple, operating at liquid nitrogen temperature, and subjected to a magnetic field, comprising an active n-type branch, made of a $Bi_{85}Sb_{15}$ material, and a passive branch, comprised of the ceramic cuprate superconductor $YBa_2Cu_30_{9-\delta}$, having a critical temperature of 97.5 K, and a critical current density of 1.9 A cm^{-2}. The experiment failed to identify an appropriate superconductor material to be used as the passive branch. Dr. Goldsmid concluded that new superconductors, having a much higher critical temperature and a much higher critical current density, would be needed in the future to perform satisfactorily as passive thermoelements.

We conclude from a survey of Grigorov's earlier research work, along with our comprehensive review of Goldsmid's historic paper of 1988, that the Grigorov superconducting polymer film is more than adequate for the manufacture of the passive branch or thermoelement of future thermoelectric energy conversion devices—should the performance of the p-type branch be substantially lower than that of the n-type branch. It should be stated that the survey of Dr. Grigorov's earlier research work also included additional subject matter that cannot be disclosed. Magnetic Power, Inc. is the sole proprietor of all such information and exclusively holds all related patent rights.

Recapitulating, I believe that the experimental evidence that resulted from L.N. Grigorov's research work on the bismuth telluride thermoelectric refrigerator will stand the test of time, and is unlikely to be significantly modified in the future. It is, in my mind, a firmly established result—a breakthrough in thermoelectrics. The above experimental evidence, recently reported to Magnetic Power, Inc. by Grigorov et al. simultaneously confirms both the validity of Dr. H. Julian Goldsmid's pioneering concept of using a passive thermoelement to replace the usually, badly-performing p-type branches, and also his equally daring prediction of the need to use high critical temperature superconductors for manufacturing these passive branches.

When Dr. Goldsmid published his historic paper of 1988, the high critical temperature, or room temperature superconductors, were still not available—they were unknown— yet he had the courage to put forth his ideas, regardless of the difficulties he was facing. It was nothing less than a stroke of genius. Dr. Grigorov's experimental result likewise definitively proved that his superconducting polymer is the right material for the manufacture of passive thermoelectric branches.

Dr. Goldsmid's pioneering concept of the passive thermoelement, utilizing a high critical temperature superconductor, as confirmed by the Grigorov experiment, is on the verge of becoming an everyday reality, even a worldwide name in thermoelectrics and in direct energy conversion. The basic theory underlying this concept is very simple. It can be found in any standard textbook on direct energy conversion, and is given in the introduction to Goldsmid's paper (3). The concept of the passive thermoelement, or passive thermoelectric branch, however, is something that came as a creative intuitive idea, that originated directly in his own mind. It is explained in a few paragraphs, occupying no more than a quarter of a page, forming the last part of the introduction to his paper. On first glance, it looks innocent and insignificant, but there is an enormous potential behind it. Thanks to the Grigorov pioneering experiment, the Goldsmid idea has been definitively verified.

Although Grigorov and Goldsmid have been conducting their research activities independently—each one of them was totally unaware of what the other was doing— yet they jointly accomplished what can be considered as a present-day technological miracle. Each of them deserves credit for such an accomplishment, which may, end up earning them the Nobel prize in physics, or chemistry, or both. I suggest with the most profound respect, therefore, that the passive branch in thermoelectric energy conversion devices, from now on, be called the Goldsmid passive thermoelectric branch. It should be called the Goldsmid-Grigorov passive thermoelectric branch, should it comprise the Grigorov (super) conducting polymer.

Dr. Goldsmid's pioneering research report of 1988 (3) was pursued by some of the finest scientists and authorities in thermoelectrics, who wrote a number of papers on the prospects and applications of high critical temperature superconductors as passive thermoelements in thermoelectric cooling (4-9). The authors of these papers comprise Kuznetsov, Vedernikov, Dittman, Dashevskii, Mosolov, and, especially, Nikolay A. Sidorenko, who authored or co-authored most of them. They all, basically deal with different types of thermoelectric (TE) coolers, and show that the magnetothermoelectric (MTE) coolers, with n-type Bi-Sb branches and passive high T_c superconducting (HTSC) branches, instead of the p-type ones, are the most promising at cryogenic temperatures. Application of HTSC materials provides the opportunity to extend the effective operating temperatures of TE, or MTE, coolers to $60<T<T_C$, where T_c is the HTSC material critical temperature.

At present, the 123-phase of $YBa_2Cu_3O_{7-x}$ films deposited on (100)$SrTiO_3$ substrate are the best HSTC branches. The $Bi_{88}Sb_{12}$ single crystals, with enhanced strength, obtained, or grown, by the Czochralski method, HTSC ceramic 123-phase of $YBa_2Cu_30_{7-x}$ +Ag and $YBa_2Cu_30_7$ films on $SrTiO_3$ substrate

were used for assembling TE couples. Tests conducted in vacuum, on TE thermocouples, operating at a hot junction temperature of 79 K, have shown that the film passive branches were more economical, in power consumption than the ceramic branches. Film HTSC materials allow one to use photolithography to prepare the entire number of TE cooler passive legs, which offers the opportunity to use integrated circuit technology for TE cooler assembly. Such technology was developed to assemble a flat shaped single stage TE cooler, consisting of 10 TE couples, with film $YBa_2Cu_30_{7-x}$ on $SrTiO_3$, HTSC passive branches, and n-type $Bi_{88}Sb_{12}$ single crystal branches. All cooler TE couples are connected in series.

Thus, at the present time, the only effective and reliable solid state cooler, operating in the temperature range of 60-90 K, is the magneto-thermoelectric cooler, where Bi-Sb single crystals, with improved mechanical strength, are used as n-type branches, and $YBa_2Cu_30_{7-x}$ films on $SrTiO_3$ substrate, prepared by a laser sputtering method, are used as passive branches. More recent developments involve the use of Bi-Sb single crystals, with only 8.5-9.5 at.% (atomic percent) of Sb, since it is considerably easier to grow perfect, and large, single crystals, containing 8.5-9.5 at.% of Sb, than containing 11.5-12 at.% of Sb. So, $Bi_{0.91}Sb_{0.09}$ single crystal was used to prepare n-type branches of single stage cryogenic MTE coolers, with operating temperatures in the range of 65-80 K.

All this serves to give a panoramic survey of some of the most significant technological research and development work that ensued from the historic discovery of Goldsmid. Regardless of its great current importance for both military and peaceful applications, this research has been in a rut for the past eight years. We now need to be looking earnestly at the new reality—a much bigger picture— in thermoelectrics, brought about by the Goldsmid-Grigorov breakthrough. There are three important components involved in that breakthrough: (1) The Goldsmid concept of the passive thermoelectric branch, comprising a high critical temperature superconductor. That concept is applicable to any kind of thermoelectric device, irrespective of the temperature range, at which they may be operating. Thus, it is not necessarily restricted to devices operating at temperatures equal, or close, to that of liquid nitrogen, or employing a bismuth-antimony alloy, as the active branch; (2) The recent disclosure outside the borders of the former Soviet Union of the historic 1985 discovery of the superconducting oxidized polypropylene polymer by Grigorov, which retains its superconducting properties up to its melting point of 700 K; and (3) The history-making, and pioneering, experiment by L.N. Grigorov, on a thermoelectric cooler, comprising bismuth telluride, as the n-type active branch, and his own superconducting, oxidized polypropylene polymer, as the passive branch.

From now on, research and development work in thermoelectrics should be increasingly focused on employing the Goldsmid passive branch, comprising Grigorov's superconducting polymer, to replace the p-type branch, in all applications where this is justified. This will lead to a gradual improvement in the figure of merit, and the thermoelectric energy conversion efficiency in a large number of applications—thermoelectric refrigerators and thermoelectric heat pumps. Thermoelectric power generators, requiring relatively low hot junction temperatures, constituting the so-called low Delta-T or low temperature difference, applications, and comprising waste-heat recovery from power plants, industrial processes, automobiles, as well as cold fusion, are also ideal candidates, for the use of the Goldsmid passive thermoelectric branch with Grigorov's superconducting polymer. This is the new reality in thermoelectrics.

There is also an economic benefit, which is crucial and could substantially accelerate the above process. Should the cost of manufacturing the passive branch comprising Grigorov's superconducting polymer be more economical than that of the active p-type branch already in use, then replacement of the latter branch, by the former, should be done automatically—even if the figure of merit of the p-type branch is the same as, or only slightly lower than, that of the n-type branch. If economics allows it, then we could look forward to a generalized use of the passive thermoelectric branch, substituting for the p-type active branch. Economics permitting, I envision a complete replacement of the p-type branch, by a passive branch, in all types of thermoelectric energy conversion devices in the near future— except those operating at moderate and high hot junction temperatures. I also foresee, again with economics permitting, that the majority, if not all, of the thermoelectric energy conversion devices, will in the more distant future be comprised of a semiconducting active branch and a superconducting passive branch.

The question that naturally arises now is: Is the Goldsmid-Grigorov achievement, or breakthrough, enough to create a new revolution in thermoelectric energy conversion? The answer is yes, but only to a limited extent. The Goldsmid, or the Goldsmid-Grigorov, passive thermoelectric branch, may be used to replace the p-type active branch, in all those devices, where the figure of merit of the p-type branch is markedly inferior to that of the n-type branch. That would lead to a general improvement in the overall figure of merit, and thermoelectric energy conversion efficiency, of many of the devices currently in use.

All the foregoing represents only two of the three pieces of the puzzle, and that refers to the Goldsmid-Grigorov breakthrough. The third piece is yet to come, and is at least, as important as the other two. It relates to discovering a new material to be used in the manufacture of the n-type branches of thermoelectric energy conversion devices, that will have a figure of merit on the order of 10^{-2} or even 10^{-1}, K^{-1}, if at all possible. This is where the real battle in thermoelectrics is being waged at the present time. There is currently a general feeling of pessimism, at the highest level, among the finest and most accomplished experts in thermoelectrics, as to whether that goal can ever be achieved. My response to such skepticism is my firm belief that the attainment of the goal is imminent, and that it is very likely lying right there, underneath our very noses, just waiting to be developed.

As to the technological significance of the eventual discovery of a new material for thermoelectric energy conversion having a figure of merit as indicated above or even higher, we note the preface to the pioneering book on "Thermoelectricity." It states that an eventual breakthrough in thermoelectricity will probably prove more significant to the future development of science and technology than the Bardeen-Shockley-Brattain invention of the transistor in 1949. These were Paul Egli's (10) prophetic words in 1960, and they are much truer today, than they were 36 years ago.

References

1. P.C.W. Chu,"High-Temperature Super-conductors," *Scientific American*, September (1995), pp. 162-165.

2. Magnetic Power, Incorporated, Private Communication, October(1995).

3. H,J. Goldsmid, K.K. Gopinathan, D.N. Matthews, K.N.R. Taylor and C.A. Baird, "High-T_C Superconductors As Passive Thermo-elements," *J.Phys.D: Applied Physics* 21, pp.344-348(1988).

4. V.D. Kuznetsov, M.V. Vedernikov, A.V. Dittman et al., "Effective Thermoelement with Thermoelectrically Passive HTSC Leg," *Superconductivity: Physics, Chemistry and Technology* 4, pp.616-625(1991)(in Russian).

5. Z.M. Dashevskii, N.A. Sidorenko et al.,"Cryogenic Thermoelectric Coolers with Passive Superconducting Branches," Superconductivity: *Science and Technology* 5, pp.690-693(1992) .

6. A.B. Mosolov and N.A. Sidorenko, "Application of High T_C Superconducting Materials in Cryogenic Peltier Coolers," Cryogenics 32, ICEC Supplement pp.36-39(1992).

7. N.A. Sidorenko,"Thermoelectric Materials for Peltier Cryogenic Cooler," *Cryogenics* 32, ICEC Supplement, pp.40-43(1992).

8. N.A. Sidorenko, "Prospects of High T_C Superconductors in Thermoelectric Cooling," *Proceedings 13th International Conference on Thermoelectrics*, Kansas City, Missouri, U.S.A., pp.l91-194(1994).

9. N.A. Sidorenko,"Example of Application of Thermoelectric Cooler with High T_C Superconducting Elements," *Proceedings 14th International Conference on Thermoelectrics*, St. Petersburg, Russia, pp.438-441(1995).

10. *Thermoelectricity*, edited by P.H. Egli, John Wiley & Sons, New York & London(1960).

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The Hydrogen Future Act of 1996

Editor's Comment: The U.S. DOE has been *the* primary obstacle to R&D on cold fusion and other advanced energy technologies that conflict with its self-interested world view. Thus, it is *imperative* that each citizen in a position to help use existing legislation, such as the following Act, work to further the cause of infinitely renewable clean energy. We appeal to business-persons, lawyers, friends of lawyers, and political activists of every stripe to *bombard Congress (and DOE) with questions and demands for action!*

—EFM

104th CONGRESS
2D SESSION

H.R. 4138

IN THE SENATE OF THE UNITED STATES

SEPTEMBER 27, 1996
Received

AN ACT

To authorize the hydrogen research, development, and demonstration programs of the Department of Energy, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE.
This Act may be cited as the "Hydrogen Future Act of 1996".

SEC. 2. DEFINITIONS.
For purposes of titles II and III—
(1) the term "Department" means the Department of Energy; and
(2) the term "Secretary" means the Secretary of Energy.

TITLE I—HYDROGEN

SEC. 101. PURPOSES AND DEFINITIONS.

(a) Section 102(b)(1) of Public Law 101-566 (42 U.S.C. 12401(b)(1)) is amended to read as follows:

"(1) to direct the Secretary of Energy to conduct a research, development, and demonstration program leading to the production, storage, transport, and use of hydrogen for industrial, residential, transportation, and utility applications;".

(b) Section 102(c) of Public Law 101-566 (42 U.S.C. 12401(c)) is amended—

(1) in subsection (1) by striking "; and" inserting ";";

(2) by redesignating subsection (2) as subsection (3); and

(3) by inserting before subsection (3) (as redesignated) the following new subsection:

"(2) 'Department' means the Department of Energy; and".

SEC. 102. REPORTS TO CONGRESS.

(a) Section 103 of Public Law 101-566 (42 U.S.C.12402) is amended to read as follows:

"§ 103. Report to Congress

"(a) Not later than January 1, 1999, the Secretary shall transmit to Congress a detailed report on the status and progress of the programs authorized under this Act.

"(b) A report under subsection (a) shall include, in addition to any views and recommendations of the Secretary—

"(1) an analysis of the effectiveness of the programs authorized under this chapter, to be prepared and submitted to the Secretary by the Hydrogen Technical Advisory Panel established under section 108 of this Act; and

"(2) recommendations of the Hydrogen Technical Advisory Panel for any improvements in the program that are needed, including recommendations for additional legislation.".

(b) Section 108(d) of Public Law 101-566 (42 U.S.C. 12407(d)) is amended—

(1) by adding "and" at the end of paragraph (1);

(2) by striking "; and" at the end of paragraph (2) and inserting a period; and

(3) by striking paragraph (3).

SEC. 103. HYDROGEN RESEARCH AND DEVELOPMENT.

(a)-Section 104 of Public Law 101-566 (42 U.S.C. 12403) is amended to read as follows:

"§ 104. Hydrogen research and development

"(a) The Secretary shall conduct a hydrogen research and development program relating to production, storage, transportation, and use of hydrogen, with the goal of enabling the private sector to demonstrate the technical feasibility of using hydrogen for industrial, residential, transportation, and utility applications.

"(b) In conducting the program authorized by this section, the Secretary shall—

"(1) give particular attention to developing an understanding and resolution of critical technical issues preventing the introduction of hydrogen into the marketplace;

"(2) initiate or accelerate existing research in critical technical issues that will contribute to the development of more economic hydrogen production and use, including, but not limited to, critical technical issues with respect to production (giving priority to those production techniques that use renewable energy resources as their primary source of energy for hydrogen production), liquefaction, transmission, distribution, storage, and use (including use of hydrogen in surface transportation); and

"(3) survey private sector hydrogen activities and take steps to ensure that research and development activities under this section do not displace or compete with the privately funded hydrogen research and development activities of United States industry.

"(c) The Secretary is authorized to evaluate any reasonable new or improved technology, including basic research on highly innovative energy technologies, that could lead or contribute to the development of economic hydrogen production, storage, and utilization.

"(d) The Secretary is authorized to evaluate any reasonable new or improved technology that could lead or contribute to, or demonstrate the use of, advanced renewable energy systems or hybrid systems for use in isolated communities that currently import diesel fuel as the primary fuel for electric power production.

"(e) The Secretary is authorized to arrange for tests and demonstrations and to disseminate to researchers and developers information, data, and other materials necessary to support the research and development activities authorized under this section and other efforts authorized under this chapter, consistent with section 106 of this Act.

"(f) The Secretary shall carry out the research and development activities authorized under this section only through the funding of research and development proposals submitted by interested persons according to such procedures as the Secretary may require and evaluate on a competitive basis using peer review. Such funding shall be in the form of a grant agreement, procurement contract, or cooperative agreement (as those terms are used in chapter 63 of title 31, United States Code).

"(g) The Secretary shall not consider a proposal submitted by a person from industry unless the proposal contains a certification that reasonable efforts to obtain non-Federal funding for the entire cost of the project have been made, and that such non-Federal funding could not be reasonably obtained. As appropriate, the Secretary shall require a commitment from non-Federal sources of at least 50 percent of the cost of the development portion of such a proposal.

"(h) The Secretary shall not carry out any activities under this section that unnecessarily duplicate activities , carried out elsewhere by the Federal Government or industry.

"(i) The Secretary shall establish, after consultation with other Federal agencies, terms and conditions under which Federal funding will be provided under this chapter that are consistent with the Agreement on Subsidies and Countervailing Measures referred to in section 101(d)(12) of the Uruguay Round Agreement Act (19 U.S.C. 3511(d)(12)) "

(b)(1) Section 2026(a) of the Energy Policy Act of 1992 (42 U.S.C. 13436(a)) is amended by striking ", in accordance with sections 3001 and 3002 of this Act,".

(2) Effective October 1, 1998, section 2026 of the Energy Policy Act of 1992 (42 U.S.C. 13436) is repealed.

SEC. 104. DEMONSTRATIONS.

Section 105 of Public Law 101-566 (42 U.S.C. 12404) is amended by adding at the end the following new subsection:

"(c) The Secretary shall require a commitment from

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non-Federal sources of at least 50 percent of the cost of any demonstration conducted under this section.".

SEC. 105. TECHNOLOGY TRANSFER

Section 106(b) of Public Law 101-566 (42 U.S.C. 12405(b)) is amended by adding to the end of the subsection the following:

"The Secretary shall also foster the exchange of generic, nonproprietary information and technology, developed pursuant to this chapter, among industry, academia, and the Federal Government, to help the United States economy attain the economic benefits of this information and technology." .

SEC. 106. AUTHORIZATION OF APPROPRIATIONS.

Section 109 of Public law 101-566 (42 U.S.C. 12408) is amended—

(1) by striking "to other Acts" and inserting "under other Acts";

(2) by striking "and" from the end of paragraph (2);

(3) by striking the period from the end of paragraph (3) and inserting ";"; and

(4) by adding at the end of the section the following:

"(4) $14,500,000 for fiscal year 1996;
"(5) $20,000,000 for fiscal year 1997;
"(6) $25,000,000 for fiscal year 1998;
"(7) $30,000,000 for fiscal year 1999;
"(8) $35,000,000 for fiscal year 2000; and
"(9) $40,000,000 for fiscal year 2001.".

TITLE II—FUEL CELLS

SEC. 201. INTEGRATION OF FUEL CELLS WITH HYDROGEN

PRODUCTION SYSTEMS.

(a) Not later than 180 days after the date of enactment of this section, and subject to the availability of appropriations made specifically for this section, the Secretary of Energy shall solicit proposals for projects to prove the feasibility of integrating fuel cells with—

(1) photovoltaic systems for hydrogen production; or

(2) systems for hydrogen production from solid waste via gasification or steam reforming.

(b) Each proposal submitted in response to the solicitation under this section shall be evaluated on a competitive gas is using peer review. The Secretary is not required
to make an award under this section in the absence of a meritorious proposals.

(c) The Secretary shall give preference, in making an award under this section, to proposals that—

(1) are submitted jointly from consortia including academic institutions, industry, State or local governments, and Federal laboratories; and

(2) reflect proven experience and capability with technologies relevant to the systems described in subsections (a)(1) and (a)(2).

(d) In the case of a proposal involving development or demonstration, the Secretary shall require a commitment from non-Federal sources of at least 50 percent of the cost of the development or demonstration portion of the proposal.

(e) The Secretary shall establish, after consultation with other Federal agencies, terms and conditions under which Federal funding will be provided under this title that are consistent with the Agreement on Subsidies and Countervailing Measures referred to in section 101(d)(12) of the Uruguay Round Agreement Act (19 U.S.C. 3511(d)(12)).

SEC. 202. AUTHORIZATION OF APPROPRIATIONS.

There are authorized to be appropriated, for activities under this section, a total of $50,000,000 for fiscal years 1997 and 1998, to remain available until September 30, 1999.

TITLE III—DOE SCIENTIFIC AND TECHNICAL PROGRAM QUALITY

SEC. 301. TEMPORARY APPOINTMENTS FOR SCIENTIFIC AND TECHNICAL EXPERTS IN DEPARTMENT OF ENERGY RESEARCH AND DEVELOPMENT PROGRAMS.

(a) The Secretary, utilizing authority under other applicable law and the authority of this section, may appoint for a limited term, or on a temporary basis, scientists, engineers, and other technical and professional personnel on leave of absence from academic, industrial, or research institutions to work for the Department.

(b) The Department may pay, to the extent authorized for certain other Federal employees by section 5723 of title 5, United States Code, travel expenses for any individual appointed for a limited term or on a temporary basis and transportation expenses of his or her immediate family and his or her household goods and personal effects from that individual's residence at the time of selection or assignment to his or her duty station. The Department may pay such travel expenses to the same extent for such an individual's return to the former place of residence from his or her duty station, upon separation from the Federal service following an agreed period of service. The Department may also pay a per diem allowance at a rate not to exceed the daily amounts prescribed under section 5702 of title 5 to such an individual, in lieu of transportation expenses of the immediate family and household goods and personal effects, for the period of his or her employment with the Department. Notwithstanding any other provision of law, the employer's contribution to any retirement, life insurance, or health benefit plan for an individual appointed for a term of one year or less, which could be extended for no more than one additional year, may be made or reimbursed from appropriations available to the Department.

Passed the House of Representatives September 26, 1996.

Attest: ROBIN H. CARLE,
Clerk.

By JEFF TRANDAHL,
Assistant to the Clerk.

Do it—please!

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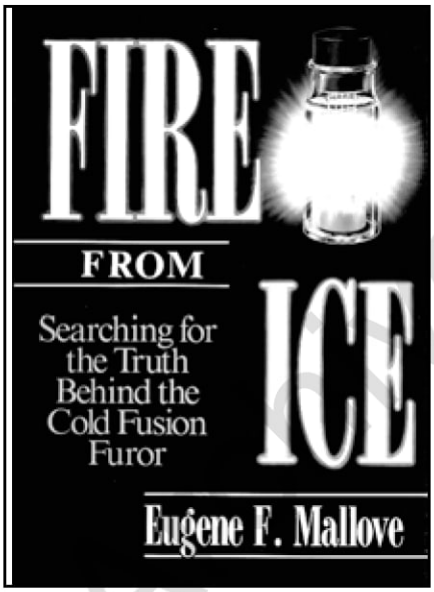

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Cold Fusion and New Energy Technology

(ISSN 1081-6372)

Eugene F. Mallove, Sc.D., Editor-in-Chief and Publisher

Now in our second year, ***INFINITE ENERGY*** magazine premiered with the March/April 1995 issue, which was distributed to the participants of the Fifth International Conference on Cold Fusion (ICCF5), held in Monte Carlo, Monaco (April 1995). The May/June 1995 issue was sent to many hundreds of current subscribers, journalists, and libraries. In 1996 we passed the 1,000 subscribers mark and now have subscribers in over two-dozen countries. The magazine now has limited distribution on select U.S. newsstands and is expected to expand greatly, now that commercial applications are emerging . *IE* is presently subscription-driven through ads in international magazines. Typical 1996 press run: 5,000 copies/issue. **[WWW site— http://ourworld.compuserve.com/homepages/JedRothwell]**

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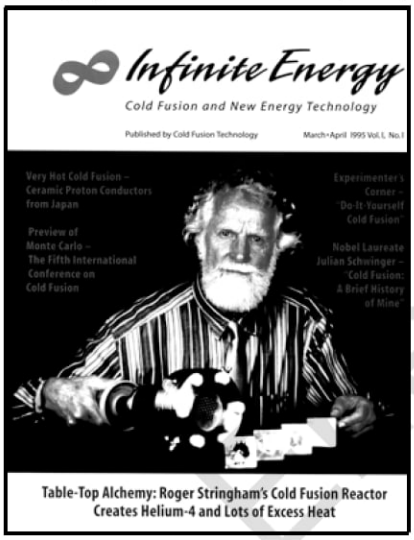

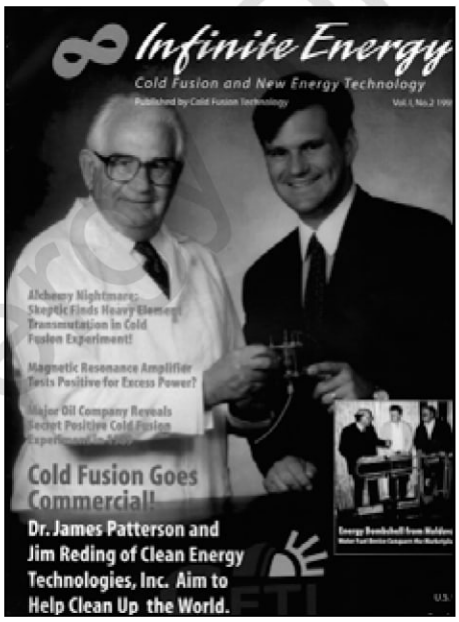

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